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LAKE MICHIGAN WATER QUALITY REPORT

1979

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Cover: Chicago's James W. Jardine Water Purification Plant

LAKE MICHIGAN

WATER QUALITY REPORT
January through December 1979

by

THE CITY OF CHICAGO
DEPARTMENT OF WATER AND SEWERS
BUREAU OF WATER OPERATIONS
DIVISION OF WATER PURIFICATION
WATER QUALITY SURVEILLANCE SECTION

and

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL

JUNE, 1980

ACKNOWLEDGEMENTS

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WATER QUALITY EVALUATION SUMMARY, 1979

A summary of the annual water quality data obtained from the 1979 Lake Michigan Survey Program is presented in a Summary Table (Table I). The bacterial and chemical data collected during 1979 when compared to the previous 10 years illustrate water quality improvement in southwestern Lake Michigan.

The results for the 1979 survey season indicate a continued downward trend in total coliform levels for the North Shore and South Shore Surveys. Average levels for the South Shore Survey continue to remain high. However, the 1979 average was the lowest since 1975, which may indicate a general downward trend for the South Shore Survey Stations. Fecal coliform geometric mean values remain three to four times higher for the South Shore Surveys than for the North Shore. Geometric means for the North & South Shore Surveys are well below the water quality standard limit of 20 per 100 ml. Fecal coliform geometric mean levels for 1979 vary little from those of the past ten years for the North and South Shore Surveys with no significant change apparent during this time. The Open Water Survey geometric means remain 0 per 100 ml. (Figures 9 & 14)

The decrease in total phosphate levels noted in the 1978 Lake Michigan Report was not continued in 1979. Excluding 1978, however, the 1979 phosphate levels were still lower for both North and South Shore surveys than levels documented during the past ten years (Figure 10). This figure indicates that phosphate levels decreased as a result of the enactment of detergent phosphrous bans and the diversion of sewage treatment discharges from the lake.

Ammonia nitrogen levels have been decreasing over the past ten years in southwestern Lake Michigan and data collected during 1979 support this trend. Average levels along the south shore remain higher than those along the north shore which have dropped below the standard limit of 0.02 mg/l. Maximum ammonia nitrogen levels continue to occur off the Indiana Harbor Canal (Figure 11).

A pilot toxic monitoring progam was initiated in 1979 in Lake Michigan's water column and bottom sediments. No detectable levels of trace organics or metals were observed in the water column. At one bottom sediment station, levels above detection limits were observed for dieldrin, chlordane, and heptachlor epoxide in bottom sediment. No detectable levels were observed at the other stations.

TABLE 1

CITY OF CHICAGO
WATER PURIFICATION DIVISION, WATER QUALITY SURVEILLANCE SECTION
SOUTHWESTERN LAKE MICHIGAN
WATER QUALITY EVALUATION
1979

PARAMETER	STANDARD	NEARSHORE less than 3mi. from shore		OFFSHORE more than 3mi. from shore		ALL STATIONS	
		AVERAGE	NO.	AVERAGE	NO.	AVERAGE	NO.
TURBIDITY T.U.		1.33	135	0.71	127	1.03	262
ODOR, THRESHOLD T.O.N.		1.5	135	1.2	127	1.3	262
CONDUCTIVITY µmhos		296.4	135	291.0	127	293.8	262
OXYGEN DEMAND, CHEMICAL mg/l		8.5	135	7.6	127	8.1	262
pH	7.0-9.0	8.33	135	8.32	127	8.32	262
RESIDUE, TOTAL NONFILTRABLE mg/l		3.36	135	3.67	127	3.51	262
RESIDUE, FILTRABLE mg/l	180			163.1	56	163.1	56
NITROGEN, ORGANIC mg/l		0.17	135	0.14	127	0.15	262
NITROGEN, AMMONIA mg/l	0.02	0.040	135	<0.01	127	0.022	262
NITROGEN, NITRITE-NITRATE mg/l		0.244	135	0.223	127	0.234	262
PHOSPHATE, TOTAL mg/l	0.021	0.041	135	0.039	127	0.040	262
PHOSPHATE, DISSOLVED mg/l		0.015	135	0.019	127	0.017	262
SODIUM mg/l				4.6	56	4.6	56
POTASSIUM mg/l				1.08	56	1.08	56
CHLORIDE mg/l	12.0	10.73	135	9.84	127	10.30	262
SULFATE mg/l	24.0	24.6	135	22.8	127	23.7	262
SILICA, SiO_2 mg/l				0.70	56	0.70	56
IRON µg/l	1000	30.0	52	25.0	38	27.9	90
PHENOL LIKE SUBSTANCES µg/l	1.0	<1	135	<1	127	<1	262
ASBESTOS fibers/l X 1000				28.5	4	28.5	4
PLATE COUNT, 48 HR.- 35°C /ml		1,404	135	52	127	749	262
COLIFORM, TOTAL /100 ml		269	135	3	127	140	262
COLIFORM, FECAL /100 ml geo. mean	20	1.90	135	1.02	127	1.40	262
STREP, FECAL /100 ml		1.03	83	0.08	24	0.82	107
FUNGI /ml		0.31	135	0.09	127	0.20	262
ACTINOMYCETES /ml		1.24	135	0.27	127	0.77	262
PLANKTON /ml		677	118	448	111	539	229

INTRODUCTION

Lake Michigan serves a broad spectrum of purposes. It is the source of drinking water for 5 million residents of northeastern Illinois. Its recreational opportunities attract fishing, boating, swimming and other water-oriented interests. It is the avenue for domestic and international waterborne commerce. Its readily available water for industry and commerce encouraged the growth and development of the greater Chicago metropolitan area into one of the largest industrial-commercial complexes in the United States. Ironically, Lake Michigan has also been the recipient of municipal and industrial wastes.

Recognizing the importance of Lake Michigan as a natural asset, the 75th Illinois General Assembly authorized the Illinois Environmental Protection Agency to ".... regularly conduct water quality and lake bed surveys to evaluate the ecology and the quality of water in Lake Michigan." Monitoring programs have provided information on the condition of the Illinois waters of Lake Michigan. As data are gathered on a continuing basis, it should be possible to determine long-term trends in lake water quality. Location of sampling sites for the lake survey program are shown in Figure 1. Lake water quality at the survey sites has been evaluated on the basis of the water quality standards promulgated by the Illinois Pollution Control Board, 1979. Rules and Regulations, Chapter 3: Water Pollution, 54 and Amendments July 1, 1979.

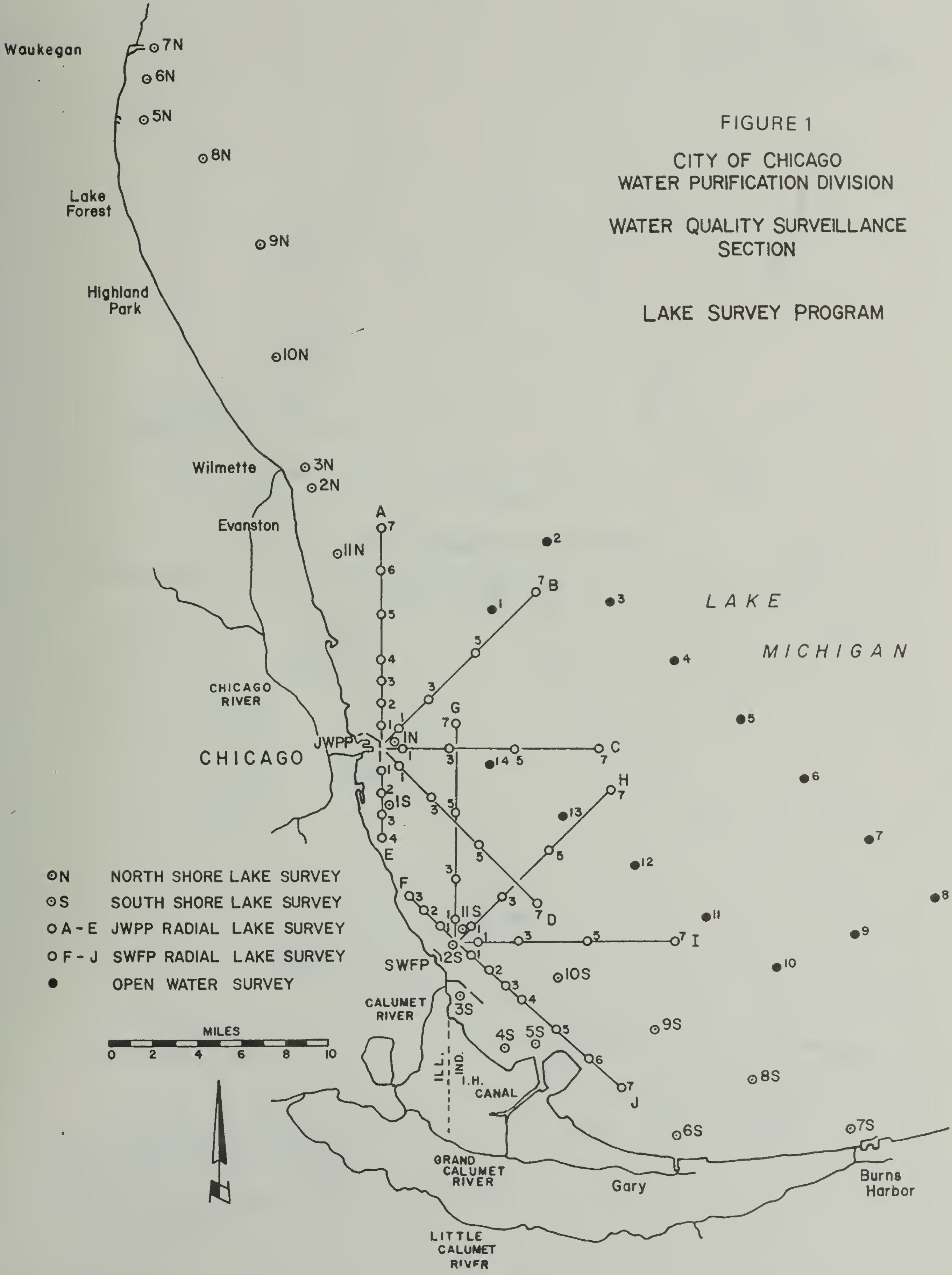


FIGURE 1

CITY OF CHICAGO
WATER PURIFICATION DIVISION

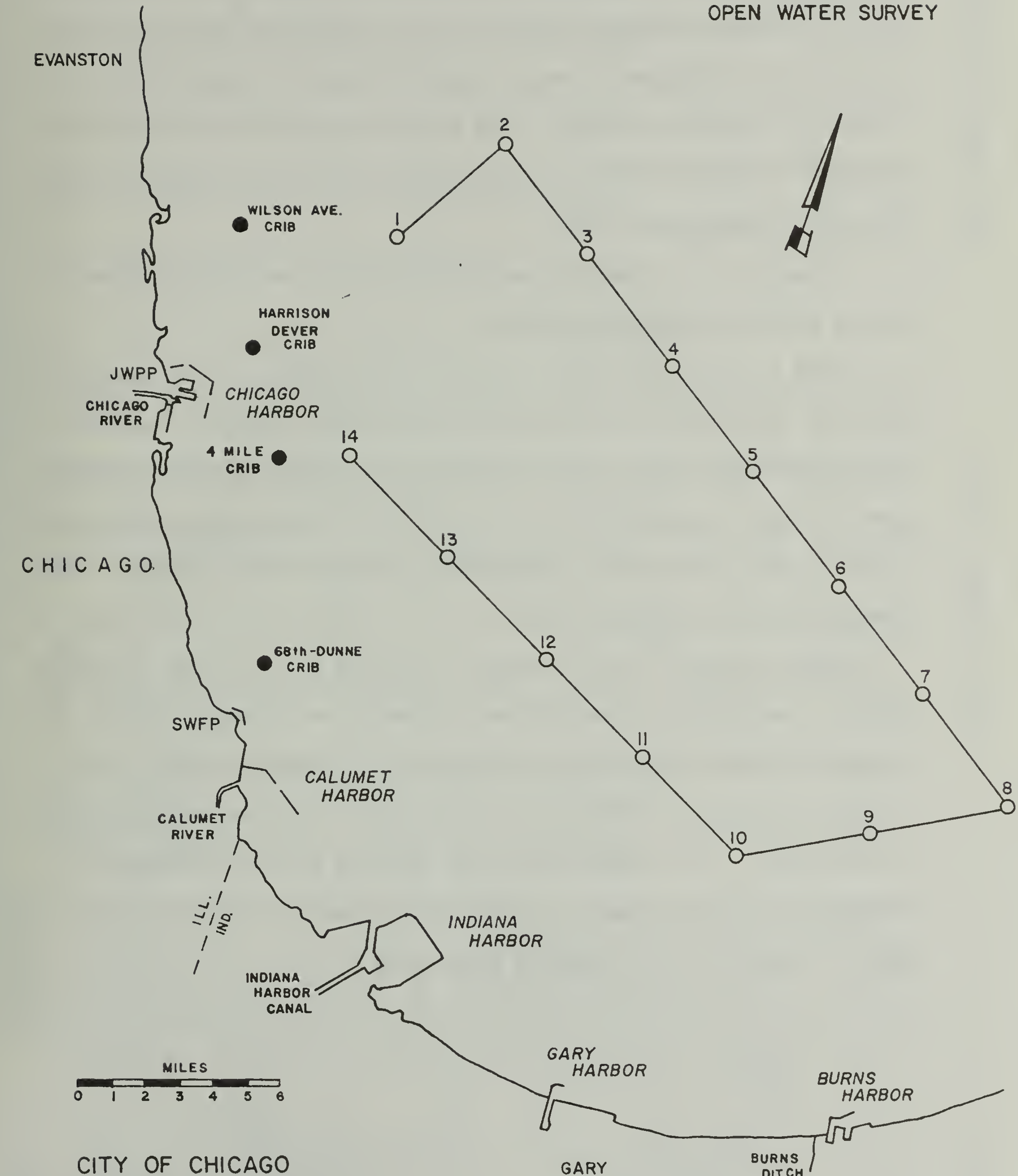
WATER QUALITY SURVEILLANCE
SECTION

LAKE SURVEY PROGRAM

Section A

Lake Michigan Water Quality

1. OPEN WATER SURVEY



CITY OF CHICAGO
WATER PURIFICATION DIVISION

WATER QUALITY SURVEILLANCE
SECTION

The Open-Water Survey consists of 14 sample points located from 6 to 17 miles offshore between Evanston, Illinois and Burns Harbor, Indiana. This survey is intended to assess open water quality away from the influence of shore discharges. The data is used to detect and monitor long-term changes occurring in Lake Michigan and as a reference to data obtained from nearshore areas.

A summary of all chemical and microbiological analyses performed during 1979 is presented in Table 2.

Based on bacterial levels, the open water quality of the southwestern basin of Lake Michigan was excellent during 1979. Although standard plate counts were higher than 1978 levels, the total coliform averages were 0 at most sample stations while points 1, 2 and 5 had average counts of 2, 2, and 1 per 100 ml, respectively. Fecal coliform geometric means remained 0 at all sample points.

Ammonia nitrogen levels averaged <0.01 mg/l at all points excepting points 2 and 12 which were 0.04 and 0.02 mg/l, respectively. Total phosphate levels were elevated as compared with those of 1978. They ranged from 0.020 to 0.080 mg/l. The standard limit for total phosphate is 0.021 mg/l. All average levels for chloride were well below the standard limit of 12.0 mg/l. Sulfate levels ranged from 21.5 to 22.3 mg/l as compared to the standard limit of 24.0.

1979
OPEN WATER LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14
TURBIDITY	T.U.	00076	4	0.64	0.50	0.50	0.49	0.45	0.46	0.45	0.88	0.89	1.05	0.55	1.08	0.60	0.85
ODOR, THRESHOLD	T.O.N.	00086	4	1.8	1.3	1.3	1.3	1.3	1.0	1.3	1.3	1.0	1.0	1.0	1.0	1.0	1.0
CONDUCTIVITY	μmhos	00095	4	291	290	289	288	288	290	291	290	290	291	293	291	293	295
OXYGEN DEMAND, CHEMICAL	mg/l	00035	4	8.7	4.8	6.3	8.2	6.3	5.3	6.3	8.2	7.3	7.3	7.0	6.6	7.0	9.8
pH		00400	4	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE	mg/l	00530	4	5.3	3.8	2.5	2.5	1.5	3.3	6.8	5.0	5.0	4.0	4.0	4.0	3.5	5.8
RESIDUE, FILTRABLE	mg/l	00515	4	165	164	164	163	170	167	155	159	162	165	164	158	167	163
NITROGEN, ORGANIC	mg/l	00605	4	0.12	0.08	0.11	0.11	0.11	0.09	0.11	0.08	0.14	0.14	0.08	0.10	0.12	0.09
NITROGEN, AMMONIA	mg/l	00610	4	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01
NITROGEN, NITRITE - NITRATE	mg/l	00630	4	0.23	0.23	0.21	0.22	0.22	0.22	0.21	0.22	0.22	0.21	0.21	0.22	0.24	0.25
PHOSPHATE, TOTAL	mg/l	00650	4	0.033	0.023	0.020	0.020	0.030	0.030	0.043	0.025	0.038	0.040	0.020	0.028	0.080	0.023
PHOSPHATE, DISSOLVED	mg/l	00653	4	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.05	0.01
SODIUM	mg/l	00929	4	4.5	4.5	4.6	4.5	4.6	4.6	4.9	4.6	4.4	4.7	4.7	4.8	4.9	4.7
POTASSIUM	mg/l	00937	4	1.05	1.08	1.08	1.05	0.98	1.03	1.10	1.08	1.18	1.05	1.10	1.10	1.10	1.12
CHLORIDE	mg/l	00940	4	9.2	9.3	9.3	9.9	9.6	9.4	9.3	9.4	9.4	9.3	9.5	9.3	9.5	9.5
SULFATE	mg/l	00945	4	22.1	22.2	22.0	22.3	21.7	22.0	21.9	22.2	21.8	21.8	21.5	21.9	21.7	21.8
SILICA, SiO_2	mg/l	00956	4	0.70	0.63	0.63	0.83	0.63	0.73	0.73	0.73	0.70	0.68	0.60	0.68	0.78	0.80
ASBESTOS fibers/l X 1000		00940	1		23.6		32.7		30.3		27.5						
PLATE COUNT, 48 HR. - 35°C	/ml	31753	4	92	13	80	10	10	8	4	5	5	5	4	71	2	8
COLIFORM, TOTAL	/100 ml	31503	4	2	2	0	0	1	0	0	0	0	0	0	0	0	0
COLIFORM, FECAL	/100ml geo. mean	31616	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI	/ml	31856	4	0.3	0.3	0.0	0.3	0.3	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.3	0.0
ACTINOMYCETES	/ml	80148	4	0.5	0.3	0.5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PLANKTON	/ml	60050	3	140	67	113	113	60	53	93	87	53	240	13	120	133	687

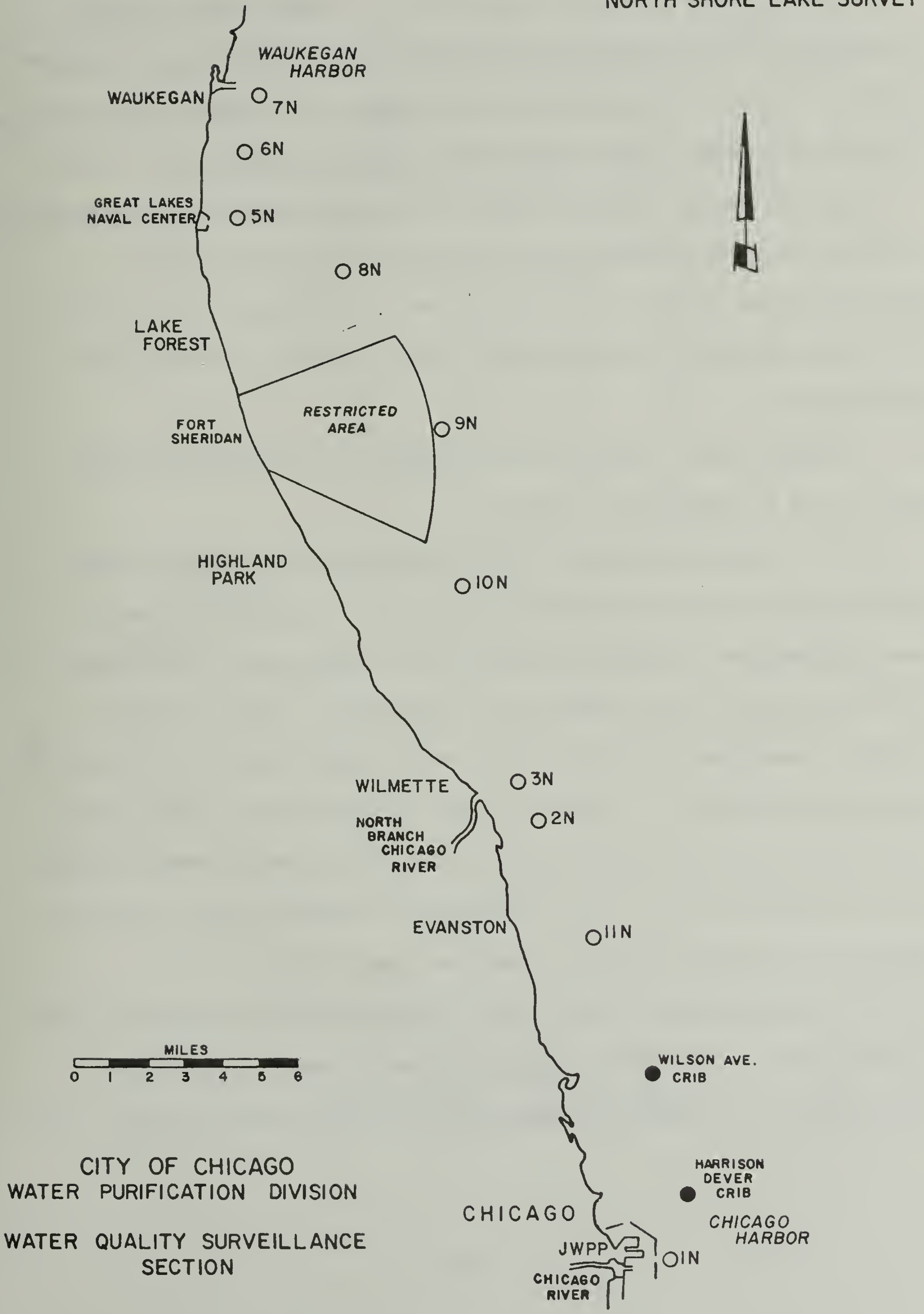
Section A (Continued)

Lake Michigan Water Quality

2. NORTH SHORE LAKE SURVEY

FIGURE 3

LAKE MICHIGAN
NORTH SHORE LAKE SURVEY



NORTH SHORE LAKE SURVEY

The North Shore Lake Survey consists of 10 sample points located between the City of Chicago Jardine Water Purification Plant and Waukegan Harbor, Illinois. The 10 sample points, numbered 1N through 11N (point 4N has been dropped), are located from 1 to 4 miles offshore.

Since all sewage treatment plant effluents along the north shore of Illinois have been diverted away from the lake, the main factors affecting water quality include creeks and boat harbors in the area, and remaining discharges along the north shore, consisting primarily of cooling water.

A summary of all chemical and microbiological analyses performed during 1979 is presented in Table 3.

Based on measured bacterial levels, water quality along the north shore continues to be consistently very good. Standard plate count averages remained low while average total coliform levels ranged from 1 to 15 per 100 ml with 6 sample points averaging 0. Fecal coliform geometric means were 0 at most points while sample points 6N, 7N, and 11N were calculated at 1, 2, and 1 per 100 ml, respectively. These values are well below the Lake Michigan fecal coliform geometric mean standard limit of 20 per 100 ml. Fecal streptococcus averages were 1 per 100 ml at points 7N and 10N while the remaining sample points were 0.

All ammonia nitrogen levels were at or below the water quality limit of 0.02 mg/l. These levels should continue to remain low with the elimination of the sewage treatment plant effluents along the north shore.

Total phosphate levels ranged from 0.020 to 0.060 as compared with the standard limit of 0.021 mg/l. The average for all points along the north shore was 0.030 mg/l

Chloride levels ranged from 10.0 to 11.1 mg/l, all below the water quality standard limit of 12.0 mg/l.

Sulfate levels remained below the standard limit of 24.0 mg/l, ranging from 22.4 to 23.6 mg/l.

TABLE 3

1979
NORTH SHORE LAKE SURVEY SUMMARY TABLE

PARAMETER	STORET NUMBER	SUR-VEYS	ANNUAL MEAN									
			1N	2N	3N	5N	6N	7N	8N	9N	10N	11N
TURBIDITY T.U.	00076	5	2.26	1.05	1.11	2.14	1.93	2.06	1.09	0.74	0.88	0.95
ODOR, THRESHOLD T.O.N.	00086	5	2.4	1.6	1.6	1.8	1.8	1.6	1.8	1.2	1.4	1.4
CONDUCTIVITY µmhos	00095	5	273	282	273	280	280	279	273	273	276	282
OXYGEN DEMAND, CHEMICAL mg/l	00335	5	7.6	6.2	9.0	9.3	6.7	10.1	7.2	5.9	9.7	8.0
pH	00400	5	8.3	8.4	8.4	8.3	8.3	8.3	8.3	8.3	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE mg/l	00530	5	2.8	2.0	3.8	2.8	2.8	1.8	2.6	2.6	3.2	3.6
NITROGEN, ORGANIC mg/l	00605	5	0.18	0.16	0.14	0.15	0.16	0.17	0.16	0.16	0.18	0.16
NITROGEN, AMMONIA mg/l	00610	5	< 0.01	< 0.01	< 0.01	0.02	0.02	0.02	0.02	0.01	0.01	< 0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	5	0.21	0.22	0.22	0.24	0.24	0.24	0.21	0.22	0.24	0.22
PHOSPHATE, TOTAL mg/l	00650	5	0.056	0.026	0.020	0.024	0.030	0.032	0.036	0.022	0.042	0.024
PHOSPHATE, DISSOLVED mg/l	00653	5	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.02
CHLORIDE mg/l	00940	5	10.0	10.3	10.6	10.7	10.9	11.1	10.1	10.3	10.4	10.0
SULFATE mg/l	00945	5	22.4	22.3	22.6	23.0	23.0	23.5	23.2	22.9	23.6	22.7
PHENOL LIKE SUBSTANCES µg/l	32730	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT, 48 HR. - 35°C /ml	31753	5	62	73	49	168	128	73	37	23	58	34
COLIFORM, TOTAL /100 ml	31503	5	0	0	0	15	3	6	1	0	0	0
COLIFORM, FECAL /100 ml geo. mean	31616	5	0	0	0	0	1	2	0	0	0	1
STREP, FECAL /100 ml	31679	5	0	0	0	0	0	1	0	0	1	0
FUNGI /ml	31856	5	0.0	0.0	0.6	2.2	1.2	0.8	0.0	0.0	0.2	0.0
ACTINOMYCETES /ml	80148	5	1.0	2.4	0.8	0.4	1.2	2.6	1.0	0.8	0.6	0.0
PLANKTON /ml	60050	5	940	956	980	620	596	548	496	500	432	620

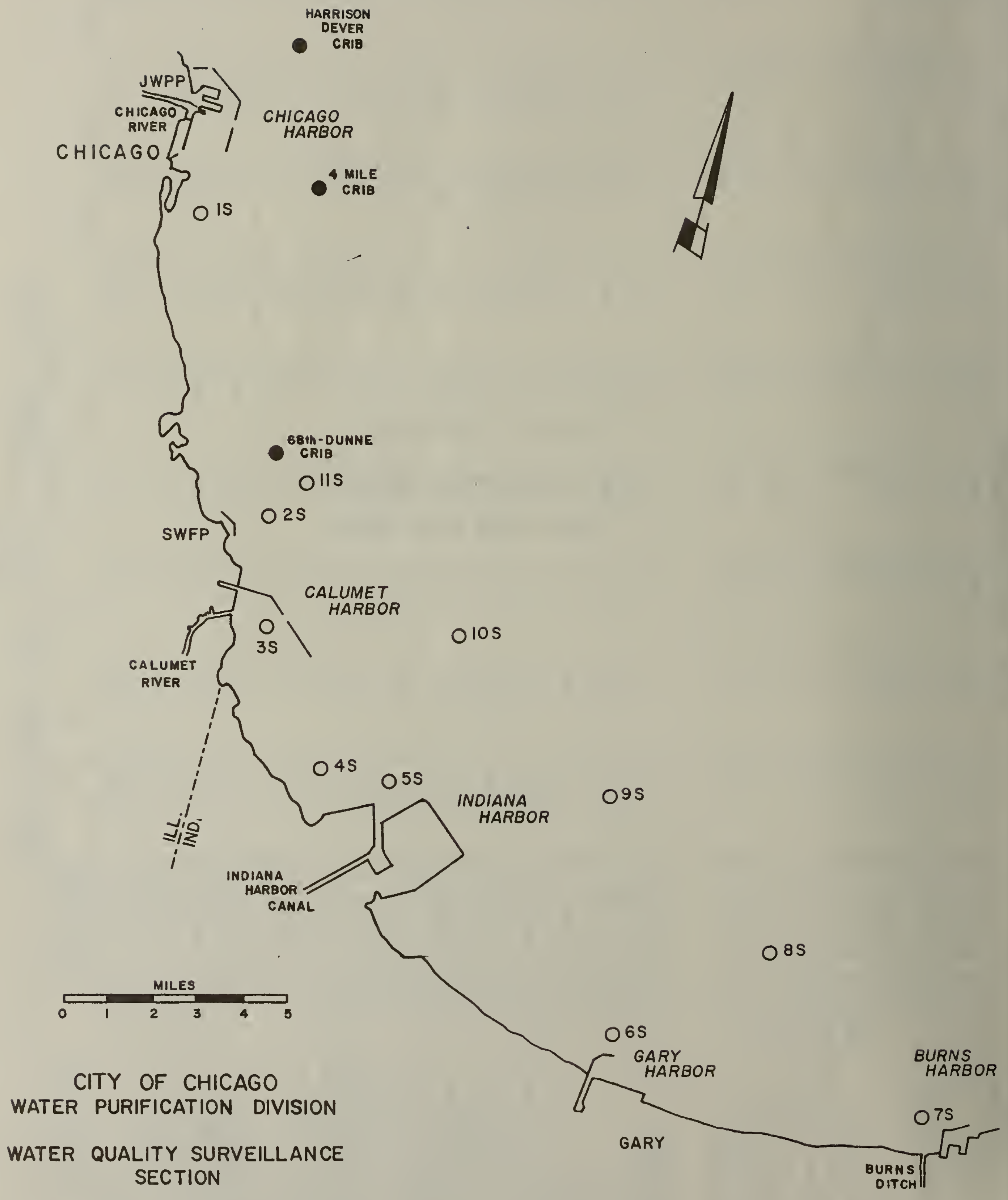
Section A (Continued)

Lake Michigan Water Quality

3. SOUTH SHORE LAKE SURVEY

FIGURE 4

LAKE MICHIGAN
SOUTH SHORE LAKE SURVEY



The South Shore Lake Survey consists of 11 sample points numbered 1S through 11S between Chicago's Burnham Park Harbor and Burns Harbor, Indiana, just east of Gary. Points 1S through 7S are within one mile of shore and are strongly influenced by shore discharges. Points 8S through 11S are from two to six miles offshore and measure the indirect effects of these discharges on the lake proper.

The major portion of this survey covers about 20 miles of shoreline which contains one of the most concentrated industrial areas in the nation. These complexes predominately involve petroleum refining and steel manufacturing. The Indiana Harbor Canal, Calumet River, and Burns Ditch are the three primary sources affecting water quality along the south shore. They are the recipients of large amounts of industrial wastes and treated wastewater and are connected directly with the lake.

Since over 90% of the water in the Indiana Harbor Canal originates in the form of treated wastewater, cooling water, or storm water overflow from sewers, it is considered to be the main source of pollution in the southwestern basin of Lake Michigan. The effluents from municipal sewage treatment plants, steel mills, and oil refineries often result in a plume which flows slowly northward from the harbor, causing periods of degraded raw water quality at Chicago's South Water Filtration Plant. This in turn requires additional water treatment for taste and odor removal.

The Grand Calumet River usually flows inland but may flow into the lake during heavy periods of precipitation. Flow at the River mouth however is lakeward due to discharges. This outward flow carries polluted Calumet Harbor water into the lake.

Burns Ditch flows into Lake Michigan through Burns Harbor and drains the Little Calumet River, which receives large volumes of sewer discharges.

A summary of all chemical and microbiological analyses performed during 1979 is presented in Table 4.

Bacterial levels at the nearshore points 2S through 7S continue to be high indicating the relative pollution load from the industrial complexes along the shore area. The highest bacterial concentrations were observed at points 3S through 6S along the Calumet, Indiana and Gary Harbor areas.

Ammonia nitrogen averages exceeded the Lake Michigan standard limit of 0.02 mg/l at points 4S, 5S and 6S with point 5S at the Indiana Harbor Canal averaging highest at 0.33 mg/l.

Total phosphate levels indicated an increase in 1979 with average levels ranging from 0.030 to 0.092 mg/l. Point 5S at the Indiana Harbor Canal had the highest average level. All survey stations were in excess of the IPCB standard limit of 0.021 mg/l for total phosphate.

Average chloride levels were within the standard limit of 12.0 mg/l at all points except 5S which averaged 14.7 mg/l. Sulfate level limits were exceeded at the nearshore locations 2S through 7S. The highest level was at point 5S with an average of 35.8 mg/l as compared with the standard limit of 24.0 mg/l.

Based on chemical and microbiological data from sample point 5S, the Indiana Harbor Canal delivers the highest pollution load to Lake Michigan in the southwest basin. Point 5S had the highest average values of all sample stations during 1979 for ammonia nitrogen, total phosphate, fecal coliform, chloride, and sulfate. The averages considerably exceeded the IPCB Lake Michigan water pollution standards for these parameters.

1979
SOUTH SHORE LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN										
				1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
TURBIDITY	T.U.	00076	6	1.20	0.75	1.25	1.00	1.63	0.73	0.75	0.58	0.63	0.61	0.66
ODOR, THRESHOLD	T.O.N.	00086	6	1.7	1.2	1.5	1.5	2.8	1.2	1.7	1.3	1.5	1.0	1.0
CONDUCTIVITY	µmhos	00095	6	292	297	303	309	345	306	299	296	296	298	298
OXYGEN DEMAND, CHEMICAL	mg/l	00335	6	8.9	8.3	8.1	11.5	9.6	7.1	6.8	7.6	6.3	11.3	5.9
pH		00400	6	8.3	8.3	8.3	8.3	8.2	8.4	8.4	8.4	8.4	8.4	8.4
RESIDUE, TOTAL NONFILTRABLE	mg/l	00530	6	2.5	3.3	3.5	3.7	3.0	3.3	1.7	3.5	2.8	2.7	2.3
NITROGEN, ORGANIC	mg/l	00605	6	0.18	0.17	0.22	0.20	0.21	0.17	0.16	0.18	0.19	0.19	0.16
NITROGEN, AMMONIA	mg/l	00610	6	0.02	0.02	0.02	0.09	0.33	0.14	0.01	0.01	0.02	0.01	0.02
NITROGEN, NITRITE-NITRATE	mg/l	00630	6	0.24	0.24	0.25	0.26	0.32	0.24	0.23	0.22	0.27	0.24	0.25
PHOSPHATE, TOTAL	mg/l	00650	6	0.038	0.033	0.040	0.063	0.092	0.040	0.043	0.037	0.040	0.038	0.030
PHOSPHATE, DISSOLVED	mg/l	00653	6	0.02	0.01	0.01	0.03	0.03	0.01	0.02	0.01	0.01	0.02	0.01
CHLORIDE	mg/l	00940	6	10.3	10.2	10.4	11.1	14.7	10.9	10.2	10.0	9.9	10.3	10.2
SULFATE	mg/l	00945	6	23.6	24.2	24.6	26.8	35.8	25.8	24.8	23.5	23.6	23.7	23.8
PHENOL LIKE SUBSTANCES	µg/l	32730	6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT, 48 HR. - 35°C	/ml	31753	6	25	370	2,445	1,517	23,078	1,119	321	63	252	199	104
COLIFORM, TOTAL	/100 ml	31503	6	13	32	73	2,639	2,199	13	55	2	4	56	4
COLIFORM, FECAL	/100 ml geo. mean	31616	6	1	2	4	58	125	3	2	0	0	1	0
STREP, FECAL	/100 ml	31679	5	0	0	2	1	12	0	0	0	0	0	0
FUNGI	/ml	31856	6	0.2	0.7	0.2	0.3	0.8	0.7	0.3	0.2	0.0	0.0	0.2
ACTINOMYCETES	/ml	80148	6	0.5	0.0	1.2	2.2	0.0	3.5	3.7	0.3	0.3	0.5	0.5
PLANKTON	/ml	60050	6	407	203	307	260	203	313	247	367	523	407	463

Section A (Continued)

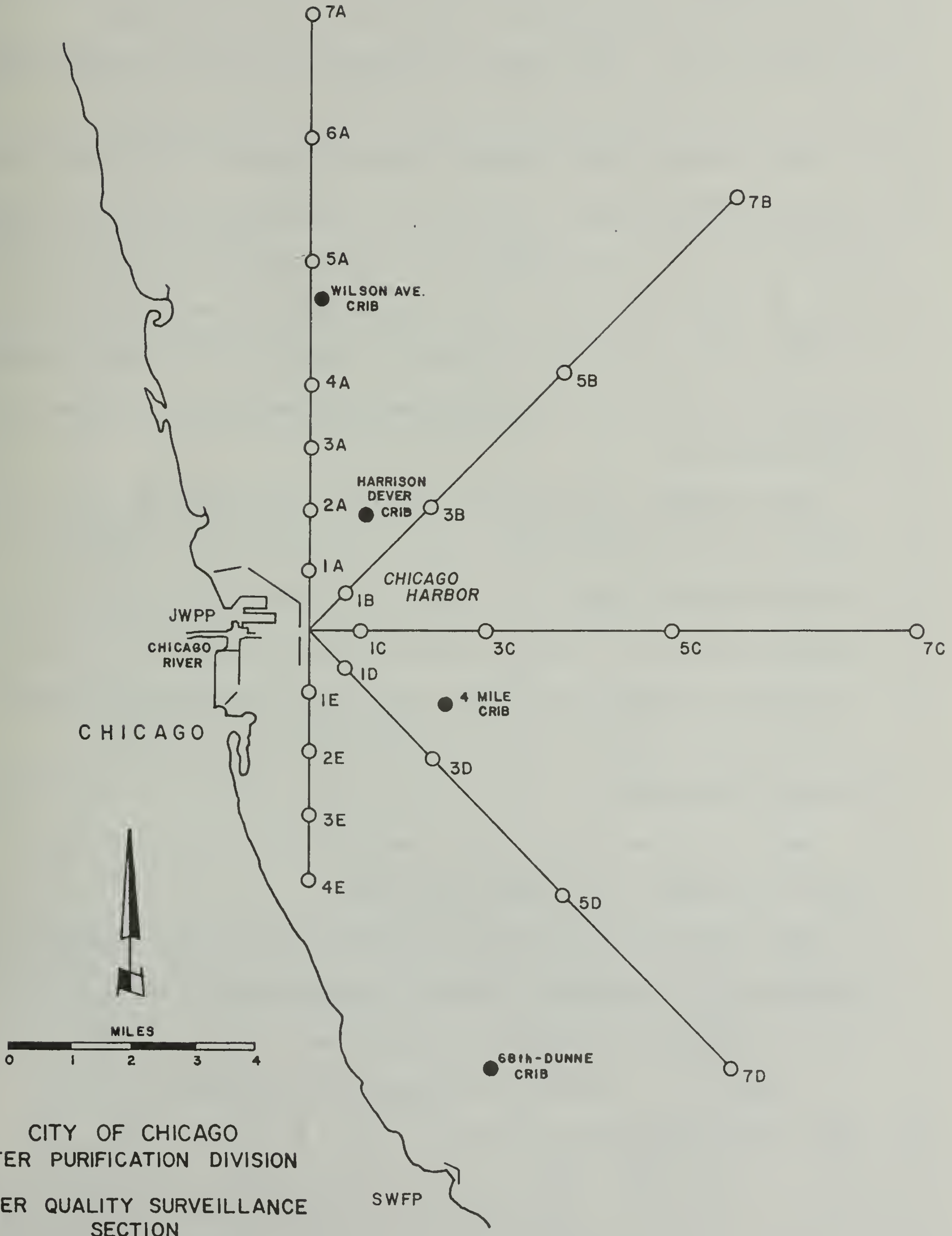
Lake Michigan Water Quality

4. JARDINE WATER PURIFICATION PLANT RADIAL SURVEY

FIGURE 5

LAKE MICHIGAN

JARDINE WATER
PURIFICATION PLANT
RADIAL SURVEY



CITY OF CHICAGO
WATER PURIFICATION DIVISION

WATER QUALITY SURVEILLANCE
SECTION

JARDINE WATER PURIFICATION PLANT RADIAL SURVEY

The J.W.P.P. Radial Lake Survey consists of 23 sample points located along 5 radii projecting from an axis point at the Jardine Water Purification Plant. This survey is intended to assess the water quality within a 10 mile radius of the Jardine Water Purification Plant.

There were two J.W.P.P. Radial Surveys performed in 1979 as compared to four performed in 1978. The first survey performed in 1979 was on May 10th and the other on September 18th. Average bacterial levels indicate water of very good quality. Total coliform averages ranged from 1 to 8 per 100 ml with 11 stations indicating 0. Fecal coliform geometric means were 2 and 1 per 100 ml at points 1A and 2A, respectively, with the remaining stations at 0.

Total phosphate levels differed significantly between the two surveys. For the May 10 survey, levels ranged from 0.020 to 0.050 mg/l with all stations averaging 0.032 mg/l. The J.W.P.P. Radial for September 18 had total phosphate levels ranging from 0.01 to 0.34 with all stations averaging 0.060 mg/l. Average total phosphate levels for the two surveys ranged from 0.20 to 0.180 mg/l with all stations averaging 0.048 mg/l.

Ammonia nitrogen average levels remained well within the standard limit of 0.02 mg/l for all sample locations.

Chloride levels averaged from 9.1 to 10.8 mg/l as compared with the standard limit of 12.0 mg/l. Sulfate averages ranged from 20.9 to 23.9 mg/l, all within the standard limit of 24.0 mg/l.

A summary of all chemical and microbiological analyses performed during 1979 is presented in Table 5.

1979
JWPP RADIAL LAKE SURVEY SUMMARY TABLE

PARAMETER	STORET NUMBER	SUR-VEYS	ANNUAL MEAN 1A	2A	3A	4A	5A	6A	7A	1B	3B	5B	7B
TURBIDITY T.U.	00076	2	1.20	1.10	1.03	1.03	1.03	0.80	0.85	0.80	0.55	0.43	0.38
ODOR, THRESHOLD T.O.N.	00086	2	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.0	1.0
CONDUCTIVITY µmhos	00095	2	283	290	295	303	303	300	303	300	295	290	295
OXYGEN DEMAND, CHEMICAL mg/l	00335	2	11.4	8.3	10.4	9.4	7.0	10.4	11.6	8.4	7.0	5.3	7.4
pH	00400	2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE mg/l	00530	2	3.0	6.5	7.0	7.5	3.0	5.0	3.5	5.0	5.0	7.0	3.5
NITROGEN, ORGANIC mg/l	00605	2	0.18	0.16	0.18	0.18	0.18	0.16	0.14	0.14	0.16	0.18	0.14
NITROGEN, AMMONIA mg/l	00610	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	2	0.21	0.21	0.23	0.24	0.24	0.24	0.24	0.21	0.21	0.20	0.20
PHOSPHATE, TOTAL mg/l	00650	2	0.065	0.035	0.020	0.035	0.030	0.035	0.045	0.090	0.040	0.105	0.060
PHOSPHATE, DISSOLVED mg/l	00653	2	0.03	0.01	0.01	0.01	0.02	0.01	0.02	0.05	0.02	0.07	0.03
CHLORIDE mg/l	00940	2	10.1	10.2	10.3	10.7	10.6	10.8	10.6	10.6	9.7	9.9	9.7
SULFATE mg/l	00945	2	20.9	21.5	22.3	23.3	22.9	22.3	23.3	23.0	22.3	21.8	21.7
PHENOL LIKE SUBSTANCES µg/l	32730	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
IRON µg/l	01045	2	31.0	13.5	12.5	14.0	21.0	14.5	12.5	16.0	12.5	14.0	10.0
PLATE COUNT, 48 HR. - 35°C /ml	31753	2	36	22	30	43	21	15	36	22	11	4	5
COLIFORM, TOTAL /100 ml	31503	2	3	1	0	3	3	3	8	1	2	0	0
COLIFORM, FECAL /100 ml geo. mean	31616	2	2	1	0	0	0	0	0	0	0	0	0
FUNGI /ml	31856	2	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
ACTINOMYCETES /ml	80148	2	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0
PLANKTON /ml	60050	2	1,860		1,440		2,100		1,020	530	1,210	560	720

City of Chicago Water Purification Division Water Quality Surveillance Section

TABLE 5 CONT.

1979
JWPP RADIAL LAKE SURVEY SUMMARY (cont'd)

PARAMETER		STORET NUMBER	SUR-VEYS	ANNUAL MEAN											
				1C	3C	5C	7C	1D	3D	5D	7D	1E	2E	3E	4E
TURBIDITY	T.U.	00076	2	0.95	0.73	0.43	0.33	0.80	0.70	0.60	0.48	1.20	1.03	0.98	0.88
ODOR, THRESHOLD	T.O.N.	00086	2	1.5	1.0	1.0	1.5	1.0	1.0	1.0	1.0	1.5	1.5	1.0	1.0
CONDUCTIVITY	µmhos	00095	2	290	300	290	290	298	295	300	288	300	295	298	298
OXYGEN DEMAND, CHEMICAL	mg/l	00335	2	9.9	10.4	7.4	7.9	8.8	8.4	8.4	7.9	7.4	7.4	8.5	9.9
pH		00400	2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE	mg/l	00530	2	6.0	2.0	4.5	4.0	4.0	2.0	3.0	5.0	3.5	4.5	3.0	3.0
NITROGEN, ORGANIC	mg/l	00605	2	0.16	0.12	0.16	0.14	0.16	0.12	0.12	0.16	0.18	0.16	0.16	0.16
NITROGEN, AMMONIA	mg/l	00610	2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	2	0.22	0.22	0.17	0.16	0.22	0.21	0.21	0.19	0.23	0.22	0.22	0.23
PHOSPHATE, TOTAL	mg/l	00650	2	0.040	0.035	0.180	0.050	0.035	0.070	0.030	0.025	0.020	0.015	0.015	0.020
PHOSPHATE, DISSOLVED	mg/l	00653	2	0.02	0.02	0.13	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
CHLORIDE	mg/l	00940	2	10.3	10.0	9.6	9.1	9.6	9.6	9.5	9.3	9.9	9.6	10.3	10.3
SULFATE	mg/l	00945	2	23.0	22.5	22.2	22.3	23.9	23.3	22.5	22.8	23.5	22.4	23.3	23.3
PHENOL LIKE SUBSTANCES	µg/l	32730	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
IRON	µg/l	01045	2	14.0	12.5	12.5	14.0	10.0	11.0	10.0	10.0	11.5	14.0	14.0	15.0
PLATE COUNT, 48 HR. - 35°C	/ml	31753	2	46	23	4	2	6	15	29	7	4	13	41	63
COLIFORM, TOTAL	/100 ml	31503	2	2	0	2	0	2	0	0	1	0	0	0	0
COLIFORM, FECAL	/100 ml geo. mean	31616	2	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI	/ml	31856	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
ACTINOMYCETES	/ml	80148	2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.5	0.0	0.0	0.0
PLANKTON	/ml	60050	2	1,320	750	460	400	560	1,060	900	830	920		1,360	

Section A (Continued)

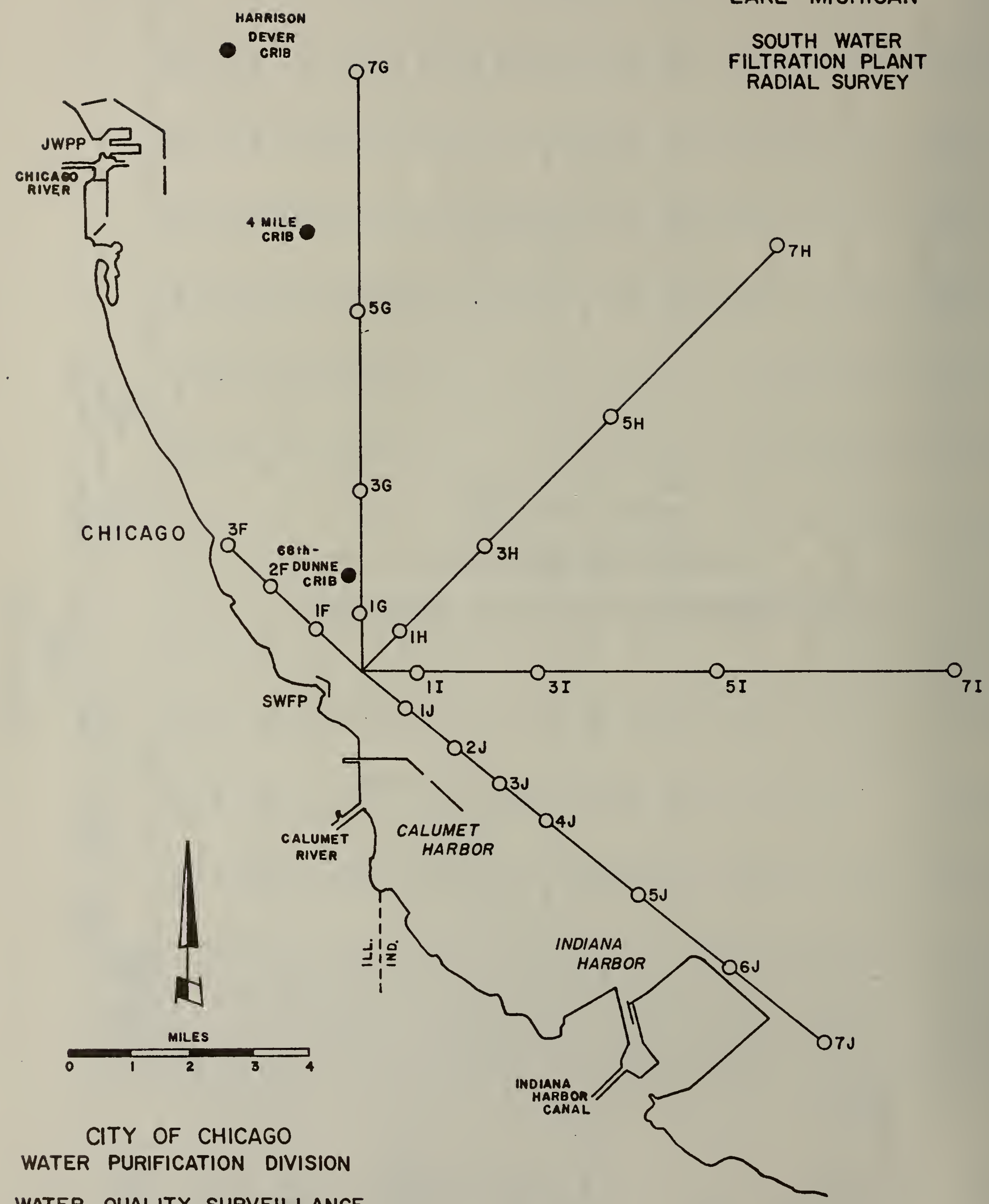
Lake Michigan Water Quality

5. SOUTH WATER FILTRATION PLANT RADIAL SURVEY

FIGURE 6

LAKE MICHIGAN

SOUTH WATER FILTRATION PLANT RADIAL SURVEY



CITY OF CHICAGO
WATER PURIFICATION DIVISION

WATER QUALITY SURVEILLANCE
SECTION

SOUTH WATER FILTRATION PLANT RADIAL SURVEY

The S.W.F.P. Radial Lake Survey consists of 22 sample points located along 5 radii out from an axis point near the South Water Filtration Plant. The purpose of this survey is to assess the quality of the water within a 10 mile radius of the South Water Filtration Plant.

Water quality within the survey vicinity is largely determined by the action of the discharges from the Calumet-Indiana Harbor industrial area. Meteorological conditions determine to what extent the Indiana Harbor Canal plume and other shore discharges will flow out into the survey area. Radius "J" possessed the highest average bacterial levels as a result of the direct effect from these discharges although chemical levels were not significantly higher than other radii of the survey.

Total phosphate average levels were elevated for the area close to and just north of the South Water Filtration Plant. The sample locations included in this area are: 1I, 1H, 1G, 3G, 5G and the "F" radius. Average levels ranged from 0.045 to 0.095 mg/l as compared with the standard limit of 0.021.

A summary of all chemical and microbiological analyses performed during 1979 is presented in Table 6.

TABLE 6

1979
SWFP RADIAL LAKE SURVEY SUMMARY TABLE

PARAMETER		STORET NUMBER	SURVEYS	ANNUAL MEAN										
				1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H
TURBIDITY	T.U.	00076	2	2.05	2.05	2.40	2.10	1.90	1.65	0.93	2.00	1.10	0.60	0.58
ODOR, THRESHOLD	T.O.N.	00086	2	1.0	1.0	1.0	1.5	1.0	1.0	1.0	1.5	1.5	1.0	1.0
CONDUCTIVITY	µmhos	00095	2	303	305	300	308	308	300	290	305	310	295	295
OXYGEN DEMAND, CHEMICAL	mg/l	00335	2	8.1	9.6	9.0	10.5	9.1	9.1	8.6	9.0	9.1	9.0	4.4
pH		00400	2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE	mg/l	00530	2	2.0	5.0	3.0	5.0	2.5	3.0	2.5	2.5	5.5	2.5	4.5
NITROGEN, ORGANIC	mg/l	00605	2	0.18	0.17	0.17	0.18	0.17	0.17	0.14	0.14	0.19	0.17	0.13
NITROGEN, AMMONIA	mg/l	00610	2	< 0.01	< 0.01	< 0.01	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	2	0.29	0.30	0.30	0.32	0.33	0.29	0.28	0.32	0.27	0.24	0.23
PHOSPHATE, TOTAL	mg/l	00650	2	0.055	0.050	0.060	0.090	0.045	0.095	0.040	0.050	0.035	0.020	0.020
PHOSPHATE, DISSOLVED	mg/l	00653	2	0.01	0.01	0.01	0.01	0.02	0.07	0.02	0.01	0.01	0.01	0.01
CHLORIDE	mg/l	00940	2	11.0	11.2	11.2	11.7	11.6	11.3	11.1	11.9	11.3	10.1	10.5
SULFATE	mg/l	00945	2	24.0	24.2	24.2	25.3	26.2	24.7	24.3	25.4	25.5	24.5	24.2
PHENOL LIKE SUBSTANCES	µg/l	32730	2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
IRON	µg/l	01045	2	38.5	60.0	36.0	95.0	24.0	28.0	170.0	26.0	20.0	29.0	10.0
PLATE COUNT, 48 HR. - 35°C	/ ml	31753	2	26	17	14	25	15	19	59	26	10	5	2
COLIFORM, TOTAL	/100 ml	31503	2	1	0	0	0	0	0	0	0	0	0	0
COLIFORM, FECAL	/100 ml geo. mean	31616	2	0	0	0	0	0	0	0	0	0	0	0
FUNGI	/ml	31856	2	0.0	0.0	1.0	0.5	0.5	0.0	0.5	0.0	0.0	0.0	0.0
ACTINOMYCETES	/ml	80148	2	0.0	6.0	1.0	1.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0
PLANKTON	/ml	60050	2	410		720	950	1,380	490	320	620	1,150	330	400

City of Chicago Water Purification Division Water Quality Surveillance Section

1979
SWFP RADIAL LAKE SURVEY SUMMARY (cont'd)

PARAMETER	STORET NUMBER	SUR-VEYS	ANNUAL MEAN 1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
TURBIDITY T.U	00076	2	1.60	1.45	0.85	0.60	2.05	1.73	1.80	1.70	1.75	1.13	0.80
ODOR, THRESHOLD T.O.N.	00086	2	1.0	1.5	1.0	1.0	1.0	1.0	1.5	1.0	1.5	1.0	1.5
CONDUCTIVITY µmhos	00095	2	303	298	295	293	303	300	303	303	313	295	293
OXYGEN DEMAND, CHEMICAL mg/l	00335	2	5.3	7.2	6.2	6.7	8.1	7.6	8.6	8.1	10.5	7.7	8.6
pH	00400	2	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
RESIDUE, TOTAL NONFILTRABLE mg/l	00530	2	3.5	4.0	2.5	2.5	5.5	5.0	3.5	5.5	3.0	2.5	3.5
NITROGEN, ORGANIC mg/l	00605	2	0.17	0.18	0.16	0.15	0.17	0.21	0.19	0.17	0.16	0.16	0.17
NITROGEN, AMMONIA mg/l	00610	2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.06	0.05	0.02	0.47	< 0.01
NITROGEN, NITRITE- NITRATE mg/l	00630	2	0.31	0.27	0.24	0.24	0.25	0.25	0.25	0.25	0.27	0.23	0.21
PHOSPHATE, TOTAL mg/l	00650	2	0.045	0.050	0.040	0.020	0.040	0.050	0.035	0.040	0.040	0.045	0.020
PHOSPHATE, DISSOLVED mg/l	00653	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
CHLORIDE mg/l	00940	2	11.6	11.0	10.1	9.8	10.5	10.6	10.7	10.4	11.1	10.3	10.5
SULFATE mg/l	00945	2	26.0	26.0	25.0	25.2	26.3	26.5	27.5	26.8	28.5	26.0	26.5
PHENOL LIKE SUBSTANCES µg/l	32730	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
IRON µg/l	01045	2	31.0	36.5	23.0	10.0	34.0	21.0	28.0	15.0	16.5	11.0	166.0
PLATE COUNT, 48 HR. - 35°C /ml	31753	2	24	605	8	5	45	381	2,404	1,207	1,075	604	201
COLIFORM, TOTAL /100 ml	31503	2	0	0	0	0	0	9	6	4	3,001	0	0
COLIFORM, FECAL /100 ml geo. mean	31616	2	0	1	1	0	0	0	0	1	5	0	0
STREP, FECAL /100 ml	31679	2					0	0	0	0	0	0	0
FUNGI /ml	31856	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ACTINOMYCETES /ml	80148	2	0.5	1.0	0.5	0.0	2.5	3.5	0.0	1.5	4.0	0.0	0.0
PLANKTON /ml	60050	2	900	1,350	1,910	560	1,020		1,920		1,430		830

Section A (Continued)

Lake Michigan Water Quality

6. PHYTOPLANKTON MONTHLY VARIATION, 1979

PHYTOPLANKTON MONTHLY VARIATION, 1979

A monthly summary of phytoplankton data collected from the J.W.P.P. crib intake during 1979 is presented in Figure 7. Phytoplankton are divided into four major groups: diatoms, blue-green algae, green algae, and flagellated algae.

Diatoms continue to dominate in numbers over the other phytoplankton groups. Blue-greens and flagellates are fewer in number with some levels approaching those of the diatoms. The green algae occur in low concentrations with counts for all months during 1979 less than ten cells per ml.

Seasonal variations were such that diatoms exhibited an increase in numbers in the spring and fall. Blue-green numbers were highest during early summer and from early fall to winter. Flagellated algae peaked in mid-summer and December while green algae showed an increase in numbers of cells from late summer through December.

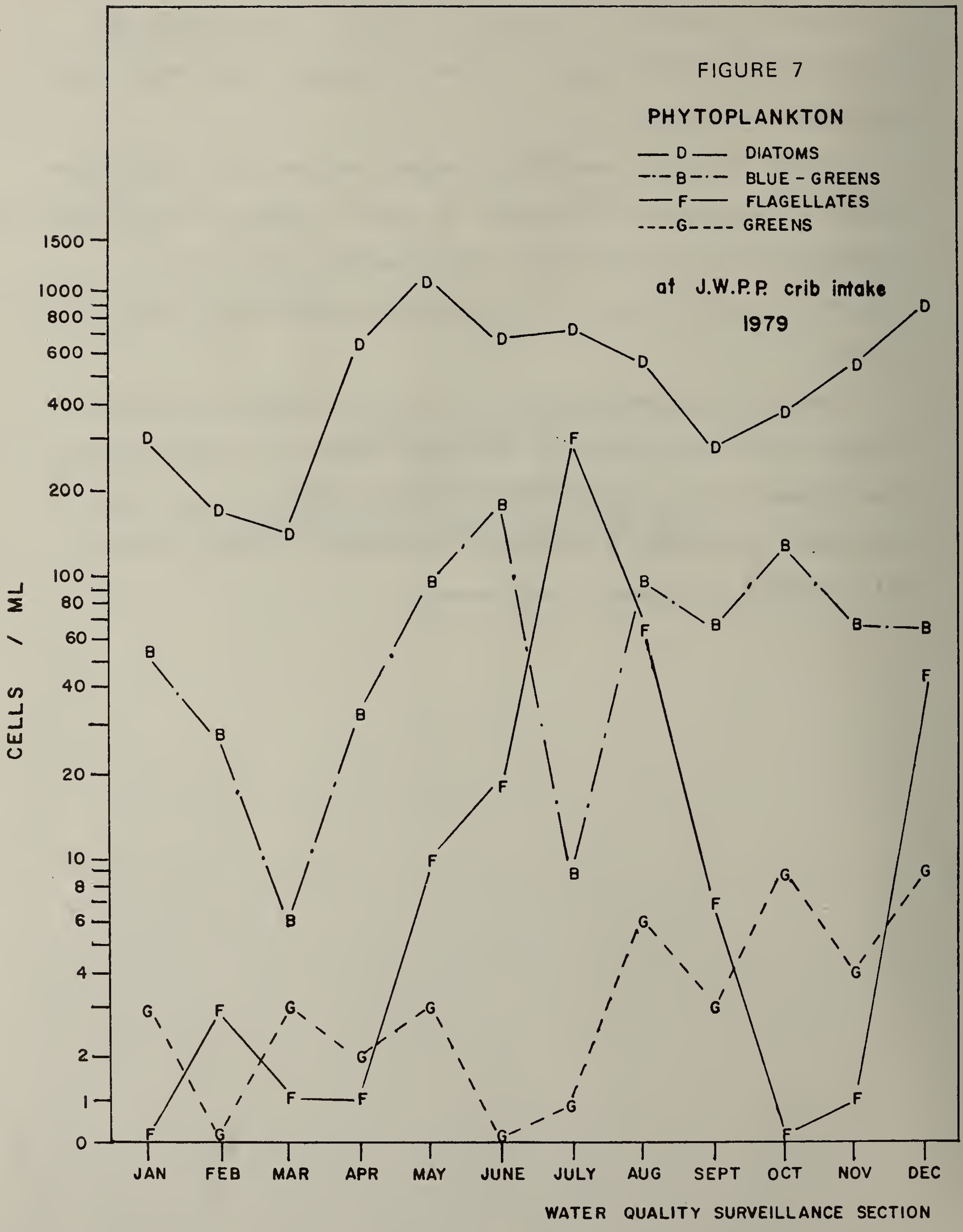


FIGURE 7
PHYTOPLANKTON
—— D —— DIATOMS
—·—B—·— BLUE - GREENS
—— F —— FLAGELLATES
----G---- GREENS
at J.W.P.P. crib intake
1979
CELLS / ML
1500
1000
800
600
400
200
100
80
60
40
20
10
8
6
4
2
1
0
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
WATER QUALITY SURVEILLANCE SECTION

Section B

TEN-YEAR TREND ANALYSES

TEN-YEAR WATER QUALITY TRENDS

Lake Survey data for 1979 has been summarized for the North Shore, South Shore and Open Water Surveys in order to provide a continuation of the ten-year trend analysis as reported in the 1978 Lake Michigan Water Quality Report. The parameters evaluated are: total coliform, fecal coliform, total phosphate, ammonia nitrogen, and phytoplankton.

TOTAL COLIFORM The results for the 1979 survey season indicate a continued downward trend in total coliform levels for the North Shore and South Shore Surveys. Average levels for the South Shore Survey continue to remain high. However, the 1979 average was the lowest since 1975, which may indicate a general downward trend for the South Shore Survey Stations. Average levels for the Open Water Survey since its inception in 1977 are presented for comparative purposes. (Figures 8 & 13)

FECAL COLIFORM Fecal coliform geometric mean values remain three to four times higher for the South Shore Surveys than for the North Shore. Geometric means for the North and South Shore Surveys are well below the water quality standard limit of 20 per 100 ml. Geometric means for points 4S and 5S continue to exceed the standard limit considerably. Fecal coliform geometric mean levels for 1979 vary little from those of the past ten years for the North and South Shore Surveys with no significant change apparent during this time. The Open Water Survey geometric means remain 0 per 100 ml. (Figures 9 & 14)

TOTAL PHOSPHATE Total phosphate average levels for 1979 were elevated for the North and South Shore Surveys as compared with 1978 averages. Excluding 1978, however, the 1979 levels are lower for both surveys than any during the past ten years. This may indicate a downward trend for total phosphate concentrations with future levels remaining relatively low but probably not as exceptionally low as those for 1978. The water quality standard limit for total phosphate in Lake Michigan is 0.021 mg/l (equivalent to the water quality standard for phosphorus (as P) of 0.007 mg/l). Average total phosphate levels for the Open Water Survey have been slightly lower than those of the North Shore Survey for the past two years. (Figures 10 & 15)

AMMONIA NITROGEN Average levels of ammonia nitrogen continue to drop for the North Shore with the lowest level recorded during 1979. This level is well below the standard limit of 0.02 mg/l. Ammonia nitrogen average levels for the South Shore, however, doubled during 1979 with the highest recorded average in seven years. The high average for 1979 can be attributed to very high individual results from survey point 5S. (Figures 11 & 16)

PHYTOPLANKTON Phytoplankton data collected at the Jardine Water Purification Plant during the past ten years are divided into four major groups: diatoms, blue-green algae, green algae, and flagellated algae. Diatoms continue to decline although they dominate in numbers over the other three phytoplankton groups.

Blue-green and flagellated algae exhibit yearly variations in numbers without any apparent trend. From 1969 to 1976 numbers of green algae gradually decreased and since 1976 have remained at the same level. (Figure 12)

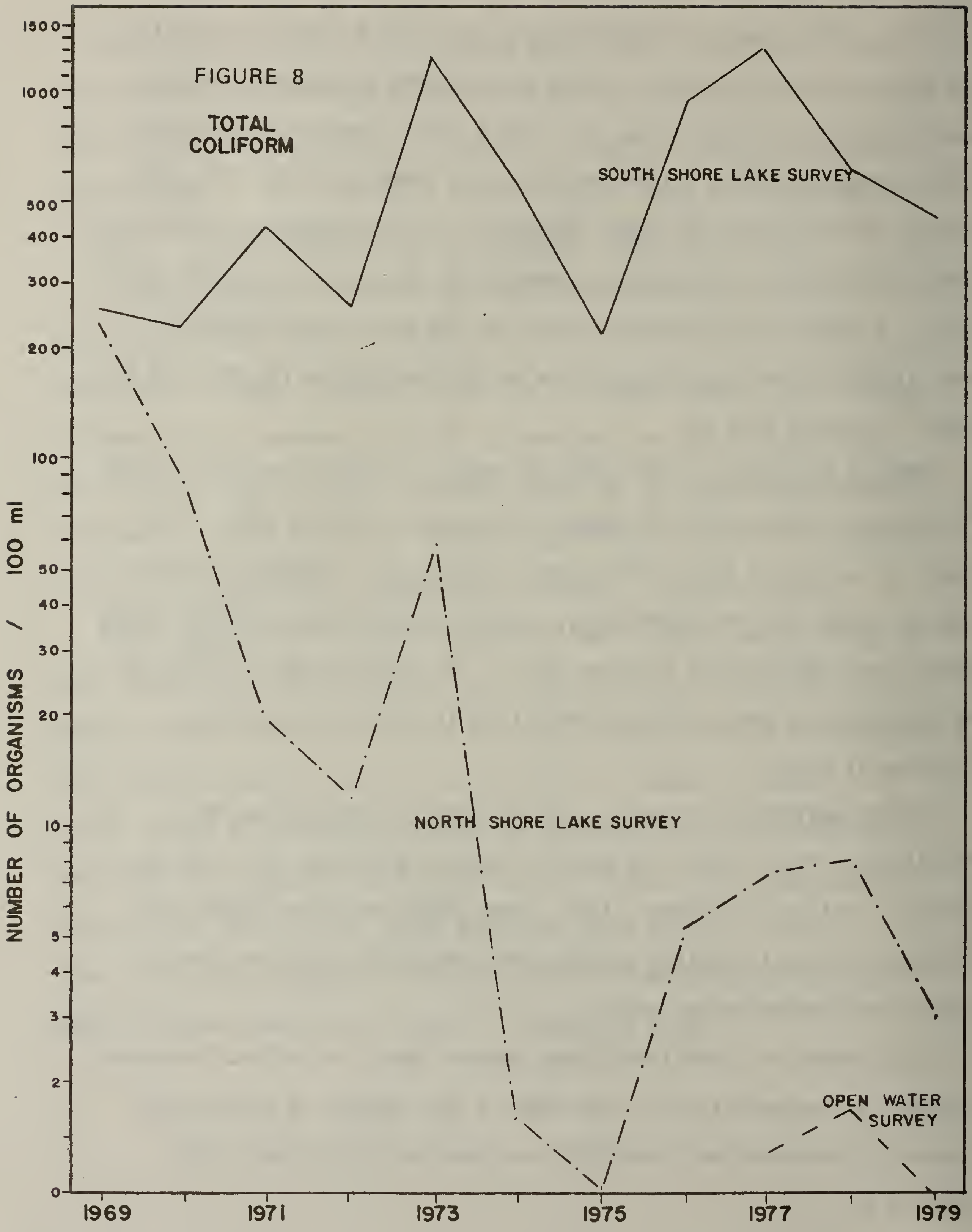
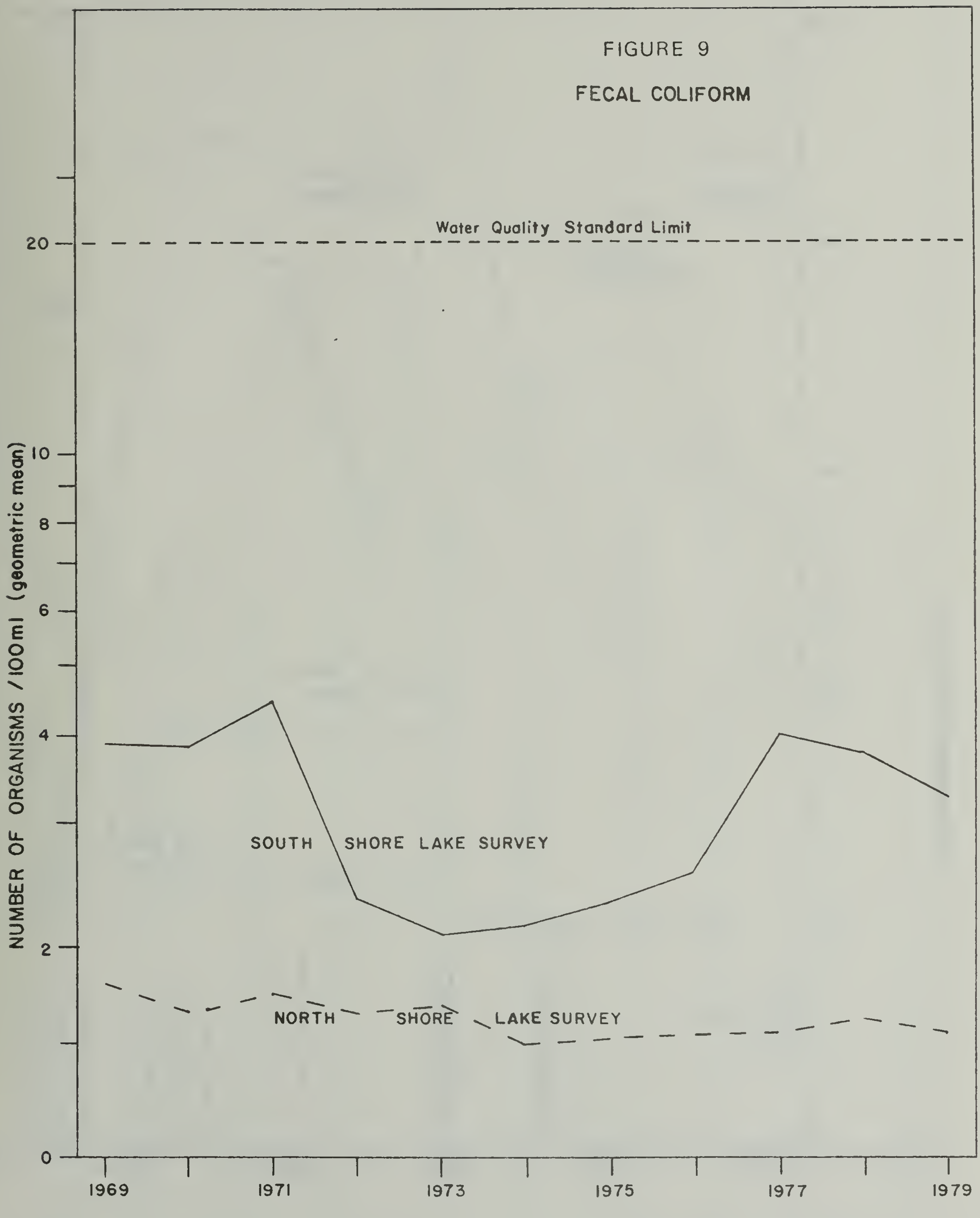


FIGURE 8
TOTAL COLIFORM
SOUTH SHORE LAKE SURVEY
NORTH SHORE LAKE SURVEY
OPEN WATER SURVEY
NUMBER OF ORGANISMS / 100 ml
1500
1000
500
400
300
200
100
50
40
30
20
10
5
4
3
2
0
1969
1971
1973
1975
1977
1979



WATER QUALITY SURVEILLANCE SECTION

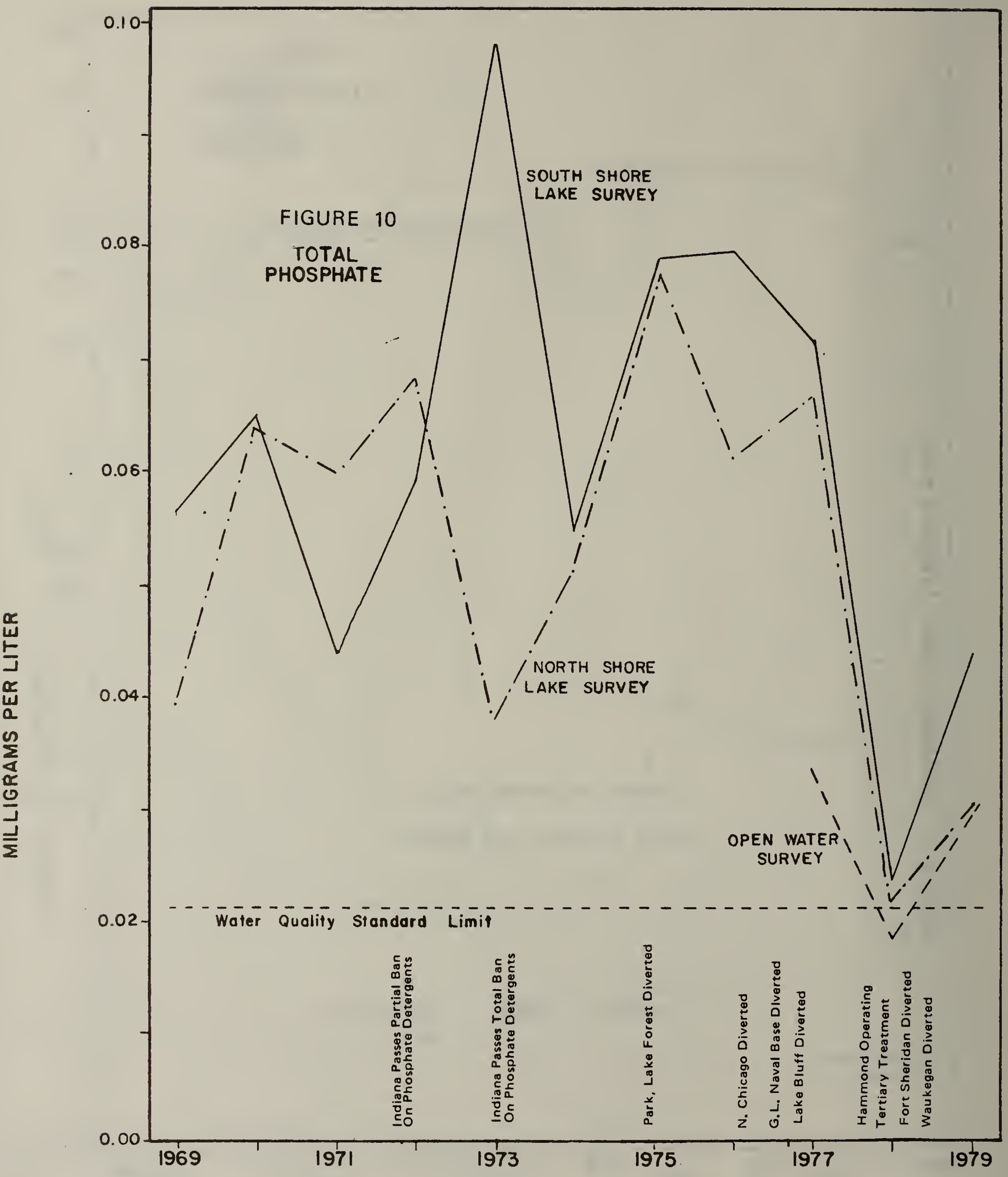


FIGURE 10

TOTAL PHOSPHATE

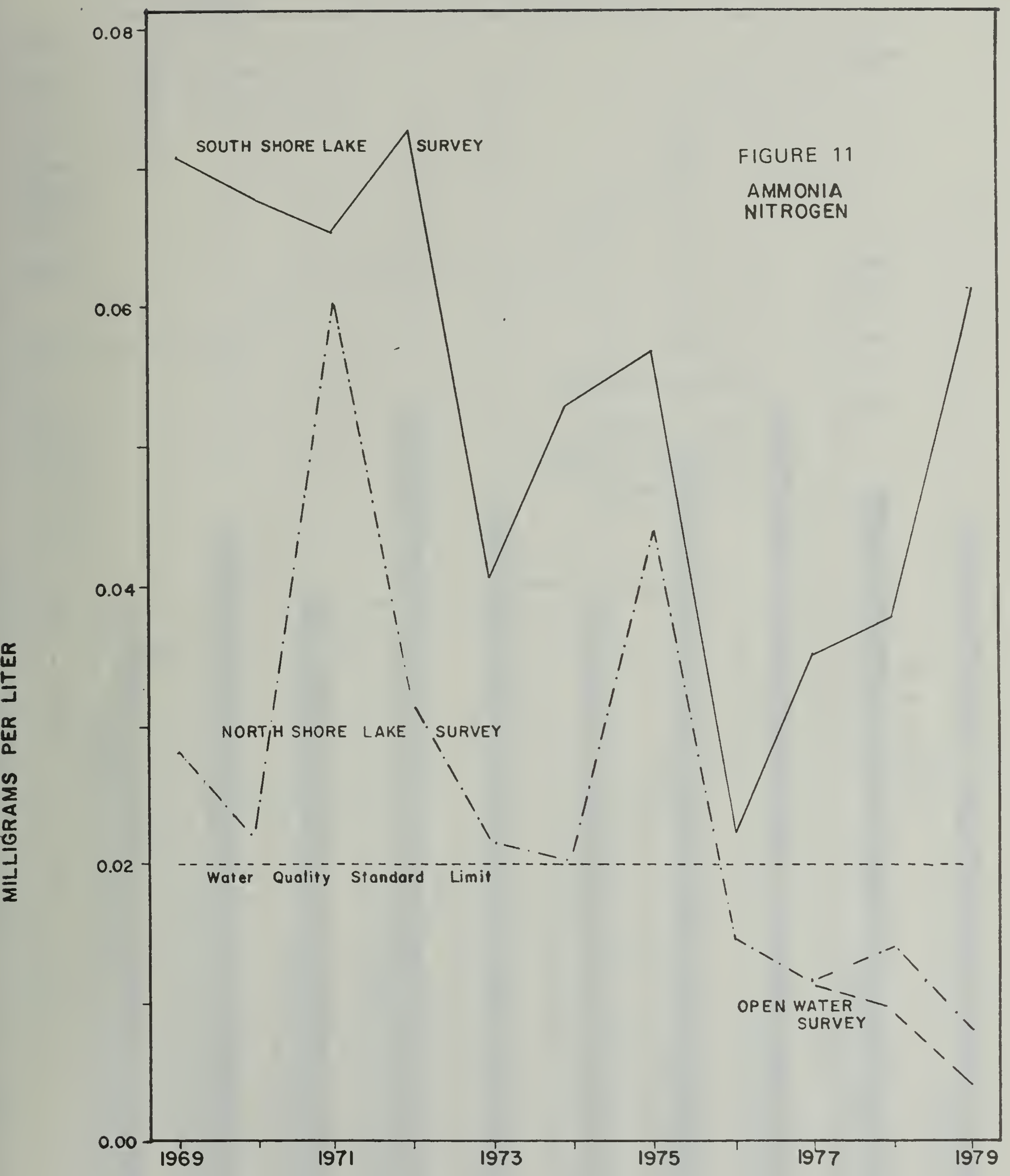


FIGURE 11
AMMONIA
NITROGEN
SOUTH SHORE LAKE SURVEY
NORTH SHORE LAKE SURVEY
Water Quality Standard Limit
OPEN WATER SURVEY
MILLIGRAMS PER LITER
0.00
0.02
0.04
0.06
0.08
1969
1971
1973
1975
1977
1979

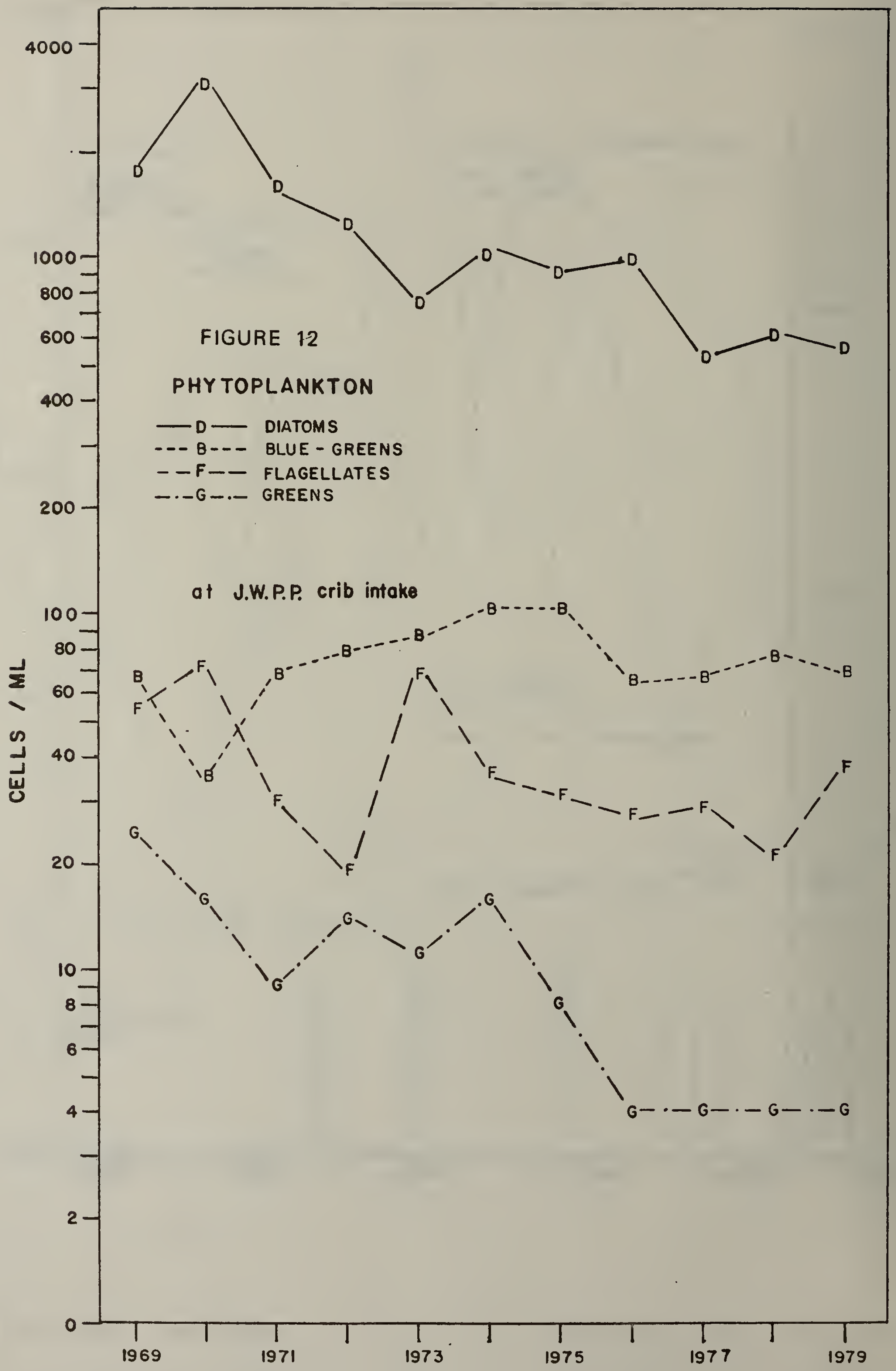
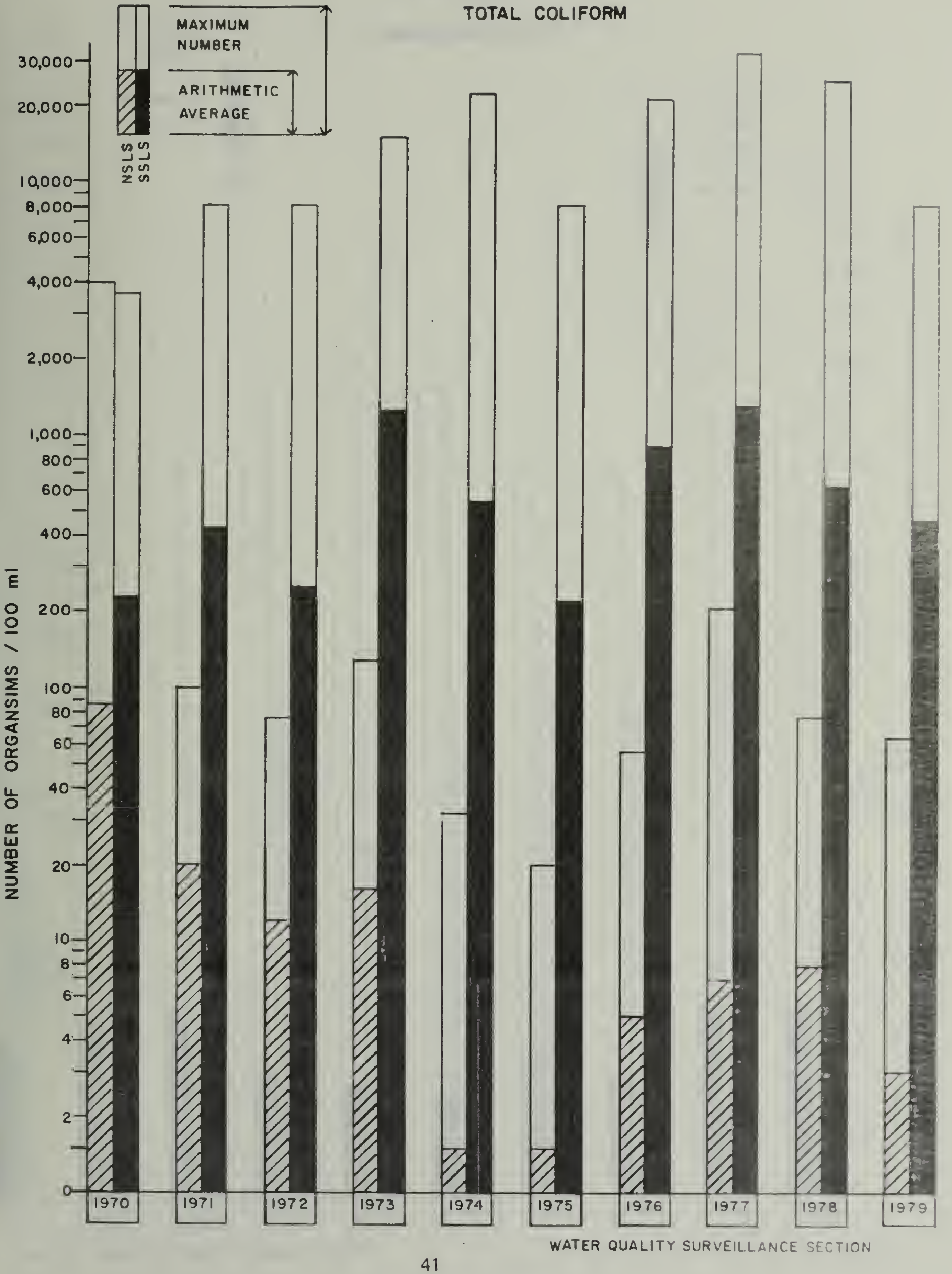


FIGURE 12

PHYTOPLANKTON

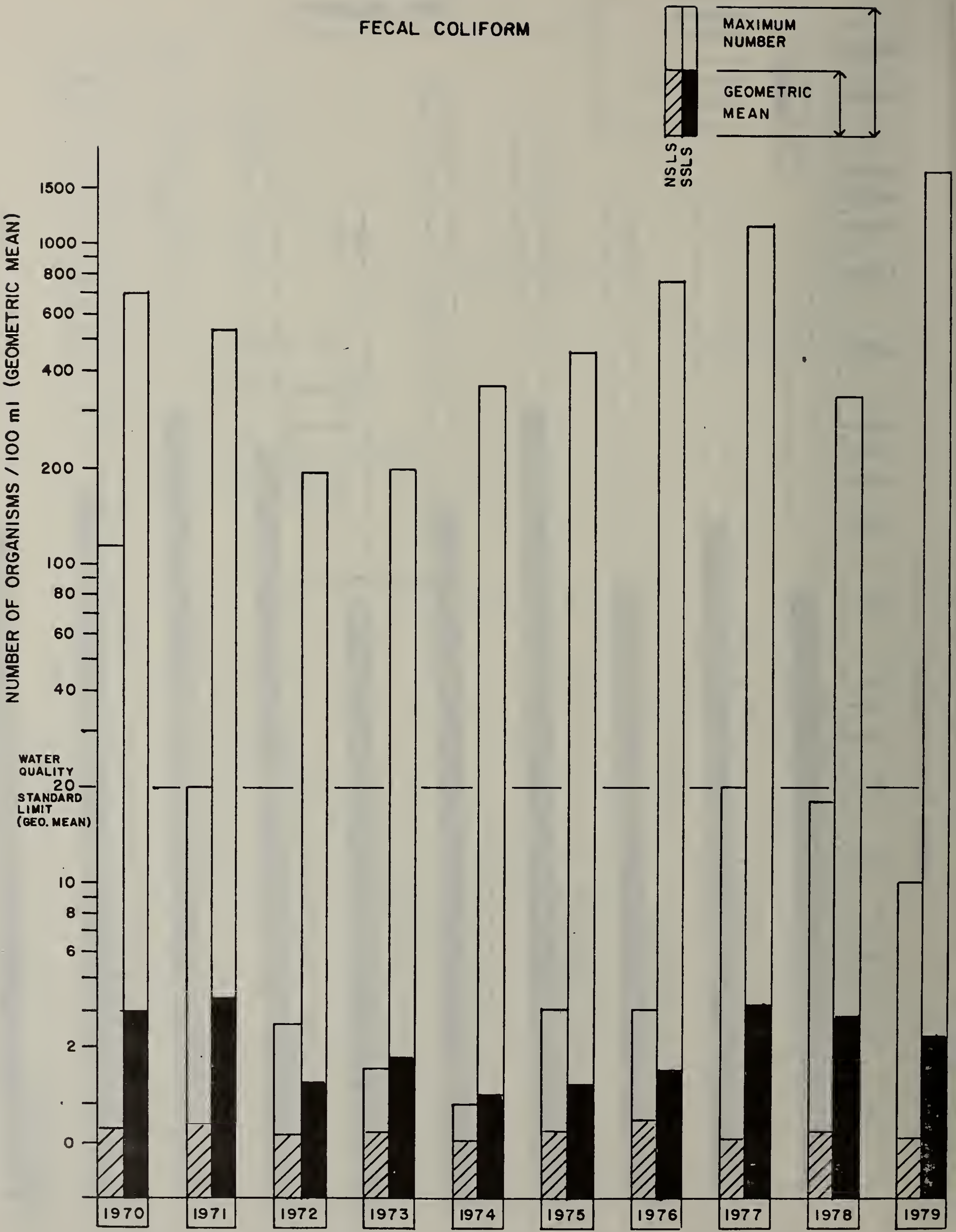
FIGURE 13

TOTAL COLIFORM



WATER QUALITY SURVEILLANCE SECTION

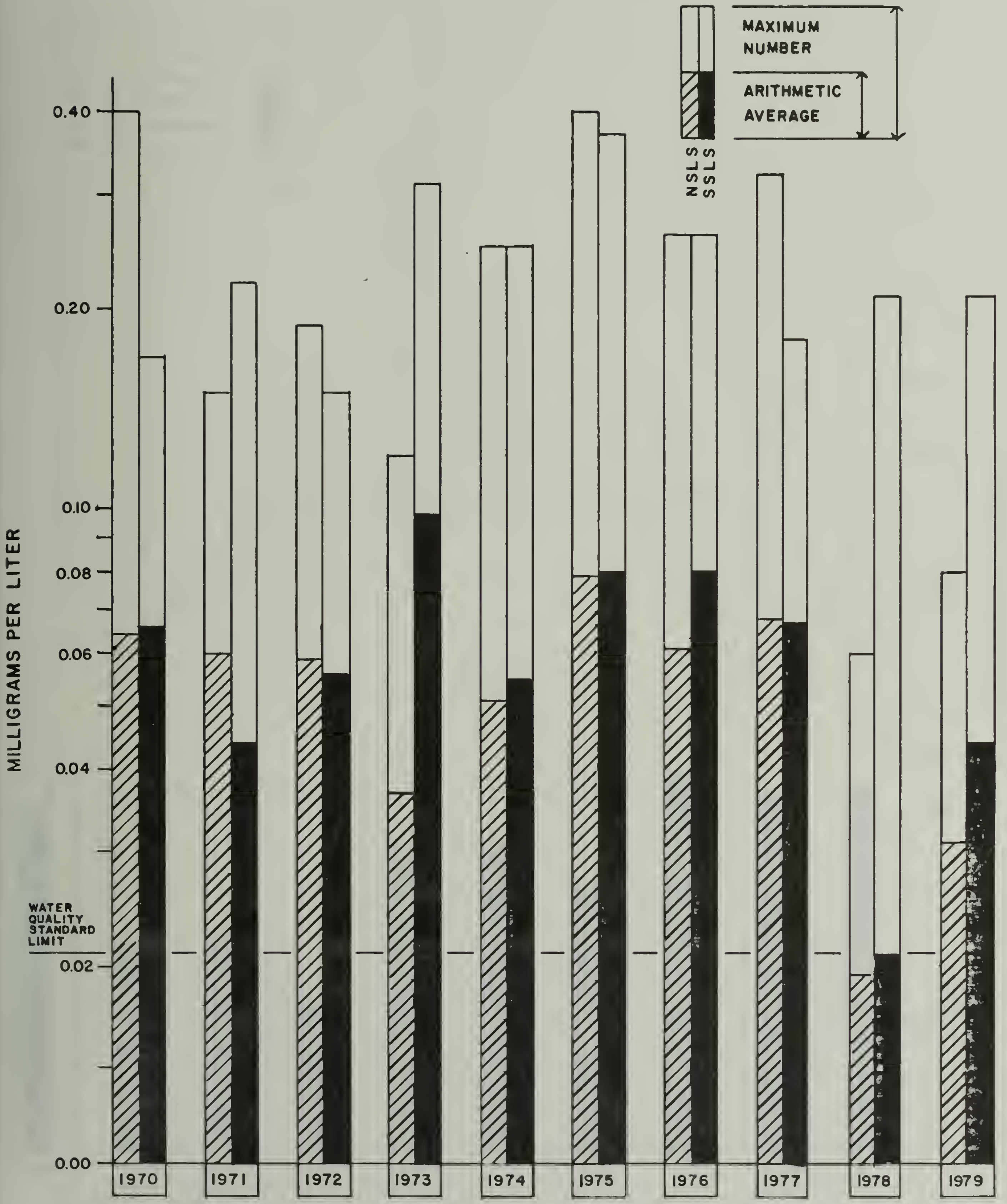
FIGURE 14



WATER QUALITY SURVEILLANCE SECTION

FIGURE 15

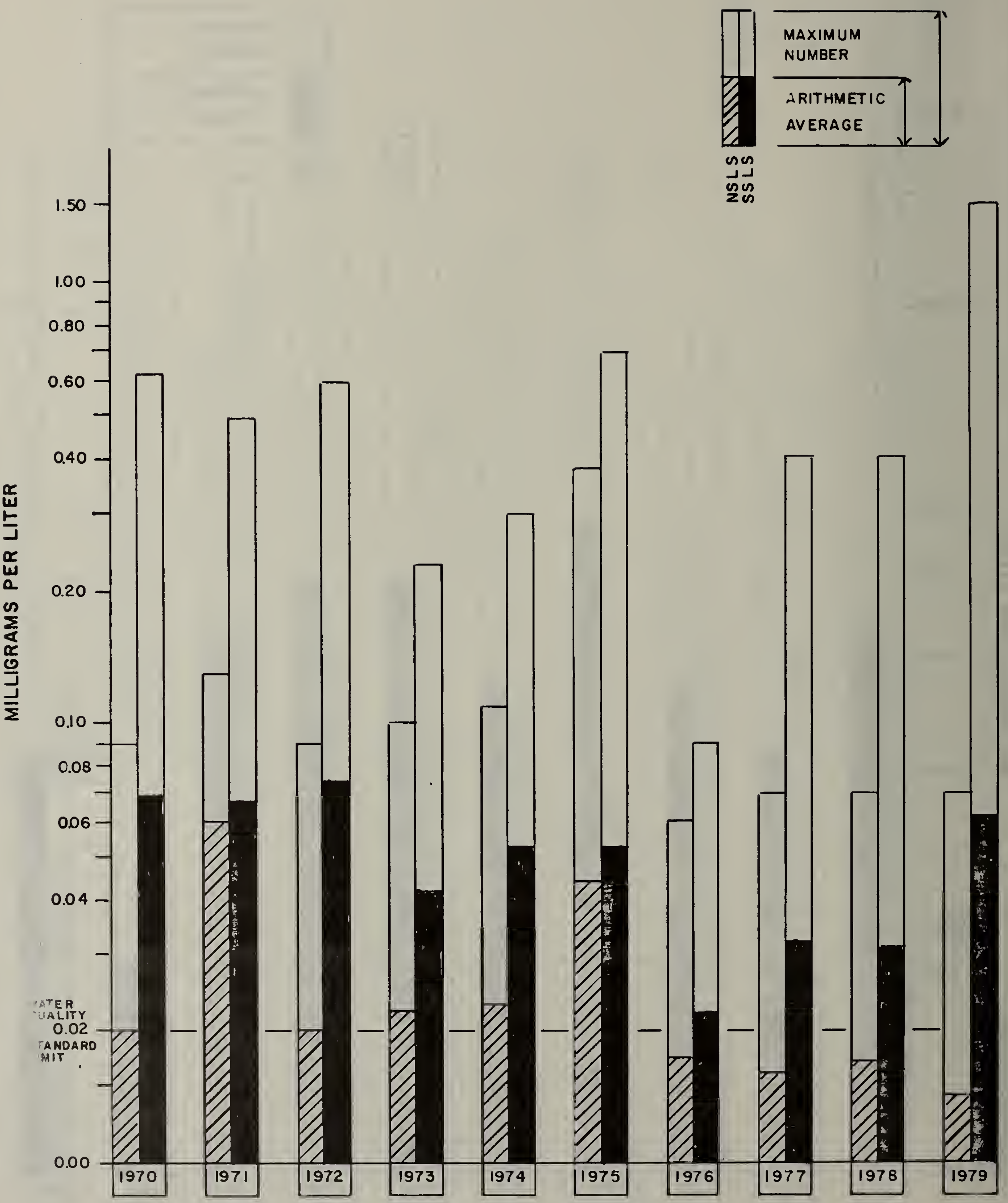
TOTAL PHOSPHATE



WATER QUALITY SURVEILLANCE SECTION

FIGURE 16

AMMONIA NITROGEN



WATER QUALITY SURVEILLANCE SECTION

Section C

ILLINOIS DISCHARGES AND POLLUTIONAL SOURCES

Section C

Illinois Discharges and Pollutional Sources

Abbott Laboratories (Manufacturer of pharmaceutical products)

In September of 1976 Abbott diverted its wastewater discharge from Lake Michigan to the North Shore Sanitary District sewage treatment plant in Gurnee. Cooling water continues to be discharged to Lake Michigan.

Commonwealth Edison Company, Waukegan Station
(Fossil-fueled power generating station)

This plant has been in operation since 1927. It utilizes Lake Michigan water for condenser cooling and discharges heated cooling water back to the lake. The maximum temperature rise through the condensers is 12°F. This station also has an ash pond discharge to the lake.

The facility has successfully demonstrated that their thermal discharge will not have a detrimental effect on the ecology of Lake Michigan and the request for relief from closed cycle cooling (off-stream cooling requirements) has been approved by the United States Environmental Protection Agency and the Illinois Pollution Control Board. Treatment facilities to bring miscellaneous, non-thermal discharges (including ash and coal pile handling systems) into compliance with applicable standards have been permitted by the Agency and constructed.

Commonwealth Edison Company, Zion Station
(Nuclear-fueled power generating station)

Initial plant operation began in 1972. This station utilizes Lake Michigan water for condenser cooling and discharges heated cooling water back to the lake. The maximum temperature rise through the condensors is 20°F.

The facility has successfully demonstrated and received approval regarding its thermal discharges. Non-thermal discharge treatment facilities, permitted by the Agency, have been completed and started operation on October 1, 1978.

Federal Installations

The Great Lakes Naval Training Center diverted its wastewater discharge from Lake Michigan to the North Shore Sanitary District's Gurnee sewage treatment plant in July, 1976.

The sewage treatment plant at Fort Sheridan was abandoned at the end of 1977 when wastewaters were diverted to the North Shore Sanitary District Gurnee treatment plant.

Johnson Outboards, Division of Outboard Marine Corporation
(Manufacturer of outboard motors)

Johnson Outboards has one discharge of treated process wastewater to Waukegan Harbor. Numerous other outfalls discharge non-contact cooling water, yard runoff and roof drain waters. One discharge enters Lake Michigan via a ditch located several hundreds yards north of the manufacturing facility and the others discharge into Lake Michigan, via Waukegan Harbor. In-plant treatment consists of oil separation, metal reduction and removal.

During 1975 and 1976 polychlorinated biphenyls (PCB's) were found in several discharges. The PCB's had been previously used as a hydraulic fluid in die cast machines. An enforcement action has been filed by the U.S. Environmental Protection Agency against Johnson Motors requiring the removal of contaminated harbor sediments and of soils on property close to Lake Michigan.

MSDGC Overflows

Sewage from all of the Lake Shore municipalities in Cook County is treated by sewage treatment facilities of the Metropolitan Sanitary District of Greater Chicago. The treated effluents are discharged to a system of waterways that are tributary to the Des Plaines River. Historically, the Chicago River and the Calumet River were tributaries of Lake Michigan. However, with the repeated outbreaks of waterborne disease epidemics experienced by Chicago in the late 1800's caused by contamination of the City's drinking water by the flow of polluted river water into the lake, the District constructed a canal system which reversed the direction of flow, diverting flows from Lake Michigan to the Mississippi River via the Des Plaines and Illinois Rivers.

Dilution of these waste flows is provided by diversion of water from Lake Michigan at three points: 1) Wilmette Pumping Station, 2) Chicago River Controlling Works and 3) the O'Brien Lock and Dam. The average diversion, for the accounting year ending February, 1978, from the Lake Michigan watershed to the Des Plaines River Watershed was 3332 CFS. This consisted of 1) 1677 CFS of domestic pumpage, 2) 743 CFS of storm runoff water and 3) 612 CFS of direct diversion.

Water levels in the waterways are regulated by the District's lock and dam facility at Lockport, Illinois. Whenever heavy rains are predicted the Lockport dam is opened, lowering the water levels to prevent flood damage. However, during severe rains, the capacity of the waterways to drain away runoff may be exceeded and one or more of the three locks may be opened causing polluted flood waters to reach the lake.

The following indicates the dates, locations, and volumes released during flow reversals in recent years:

DATE	LOCATION	(Millions of Cubic Feet)
April 11-12, 1979	Wilmette	1.5
March 4, 1979	Wilmette	6.0
September 17, 1978	Wilmette	13.2
September 13, 1978	Wilmette	4.4
June 30, 1977	Chicago River	39.7
June 30, 1977	Wilmette	3.9
June 11, 1977	Wilmette	5.4
April 24, 1976	Wilmette	18.0
August 21, 1975	Wilmette	17.4
April 18, 1975	Chicago River	151.0
April 18, 1975	Wilmette	12.0
September 17, 1972	Wilmette	12.0
August 25, 1972	Chicago River	7.9
August 25, 1972	Wilmette	25.5
June 14, 1972	Wilmette	2.7

The District is in the construction stage of Phase I of a long-term construction program to control flooding and backflows. The Tunnel And Reservoir Plan (TARP) adopted by the District consists of a system of conveyance tunnels and storage reservoirs to transport and store combined sewage flow during periods of heavy rainfall. Subsequently, these flows, which are presently discharged to the waterways, would be pumped to the District's facilities for treatment.

North Shore Sanitary District (N.S.S.D.)

The Waukegan sewage treatment plant was the only remaining North Shore Sanitary District dry weather discharge to Lake Michigan. The discharge was diverted into the Des Plaines River in May 1978. The wet weather overflow to Lake Michigan at Lake Forest was sealed June 13, 1978. Both the North Chicago and Waukegan treatment plants are designed and permitted to discharge excess wet weather flows after settling and disinfection into Lake Michigan. Alternatives of handling the wet weather flow are being studied through the Federal Construction Grant Program.

United States Steel Corporation, Waukegan Works
(Producer of stainless and carbon steel wire and springs)

In July 1977 the facility completed a program diverting all process waters, after pre-treatment, to the North Shore Sanitary District. Only cooling waters continue to be discharged to Lake Michigan.

United States Steel, South Works (Steel smelting plant)

A closed cycle system for contaminated water was completed in December, 1975. Blowdown from the process wastewater closed cycle system is discharged to Metropolitan Sanitary District of Greater Chicago collection system. Only non-contact cooling water is discharged from this plant to Lake Michigan and the Calumet River.

Water Plant Wastes

In the summer of 1977, wastewaters discharged to Lake Michigan from the City of Chicago Jardine Water Purification and South Water Filtration Plants were diverted to Metropolitan Sanitary District of Greater Chicago sewage treatment plants.

In Lake County the remaining water filtration plants discharging wastewaters to Lake Michigan at Waukegan, Highwood and Highland Park are regulated by National Pollutant Discharge Elimination System permits which include compliance schedules requiring either diversion of wastes to municipal sewage treatment plants or the construction of on-site treatment facilities necessary to meet applicable discharge standards.

Section D
TOXICS MONITORING

Section D

Toxics Monitoring

A cooperative fish fillet (edible portion) and whole fish monitoring program for toxics in Lake Michigan has been initiated by the Illinois Department of Conservation, Illinois Department of Agriculture, Illinois Department of Public Health and Illinois Environmental Protection Agency; however, analyses are not available as of this printing.

A summary of available Lake Michigan fish toxic data from the Great Lakes Fishery Laboratory (1451 Green Road, Ann Arbor, Michigan 48105) is presented in figures 17, 18 and 19. These figures illustrate the average levels of chlorinated hydrocarbons that were found in whole fish taken from Eastern Lake Michigan. The banning of DDT in 1969, a "phase out" ban of dieldrin in 1974, and programs for the control of PCB's appear to have lessened the contamination problem (USEPA Profile of Environmental Quality - Region V the Midwest, 1979).

In 1979 a pilot toxics monitoring program was initiated for Lake Michigan's water column and bottom sediments. Trace organic and metals analyses of the water column were performed at 5 Lake Michigan stations (5A, 5B, 5C, 5D, 4E). Parameters and detection limits are listed below.

Water Column

Parameter	Detection Limit (ug/l)
PCB's	0.1
Dieldrin	0.01
Chlordane	0.02
DDT	0.01
Heptachlor epoxide	0.01
Lindane	0.01
Aldrin	0.01
Endrin	0.01
Heptachlor	0.01
Methoxychlor	0.05

Parameter	Detection Limit (ug/l)
Lead	10
Copper	5
Iron	30
Mercury	0.05
Zinc	10
Manganese	10
Arsenic	0.002
Cadmium	4
Chromium	4

No detectable levels of trace organics or metals were observed.

Bottom sediments from 6 Lake Michigan Stations (5A, 5J, 5S, 7S, 5H, 2S) were analyzed for trace organics. Parameters and detection limits for these analyses are listed below.

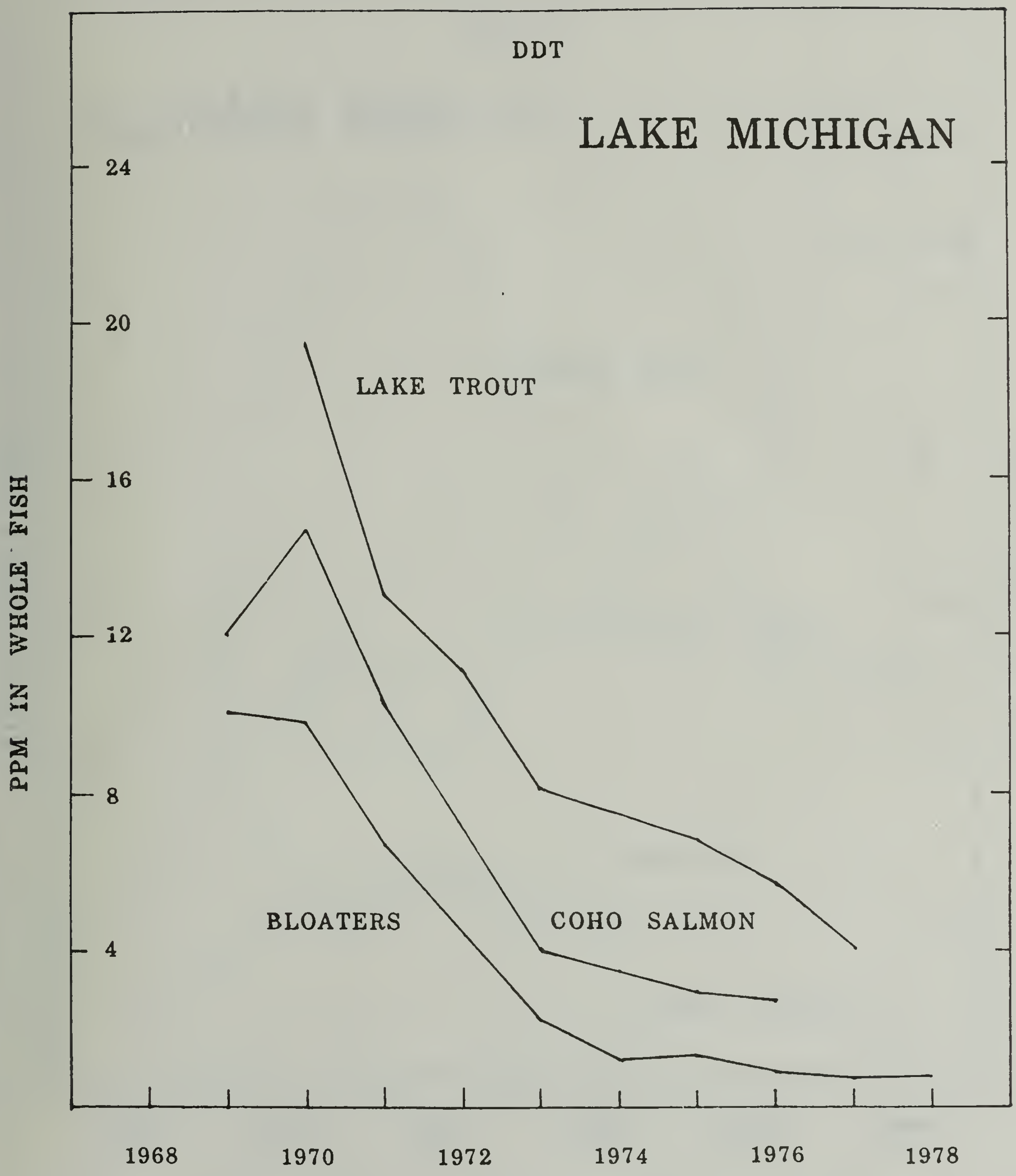
Bottom Sediment

Parameter	Detection Limit (ug/Kg)
PCB's	10
Dieldrin	1
Chlordane	5
DDT	1
Heptachlor epoxide	1
Lindane	1
Aldrin	1
Endrin	1
Heptachlor	1
Methoxychlor	5

At one station (5A) levels above the detection limits were detected for dieldrin (5.4 ug/Kg), chlordane (17 ug/Kg) and heptachlor epoxide (1.8 ug/Kg).

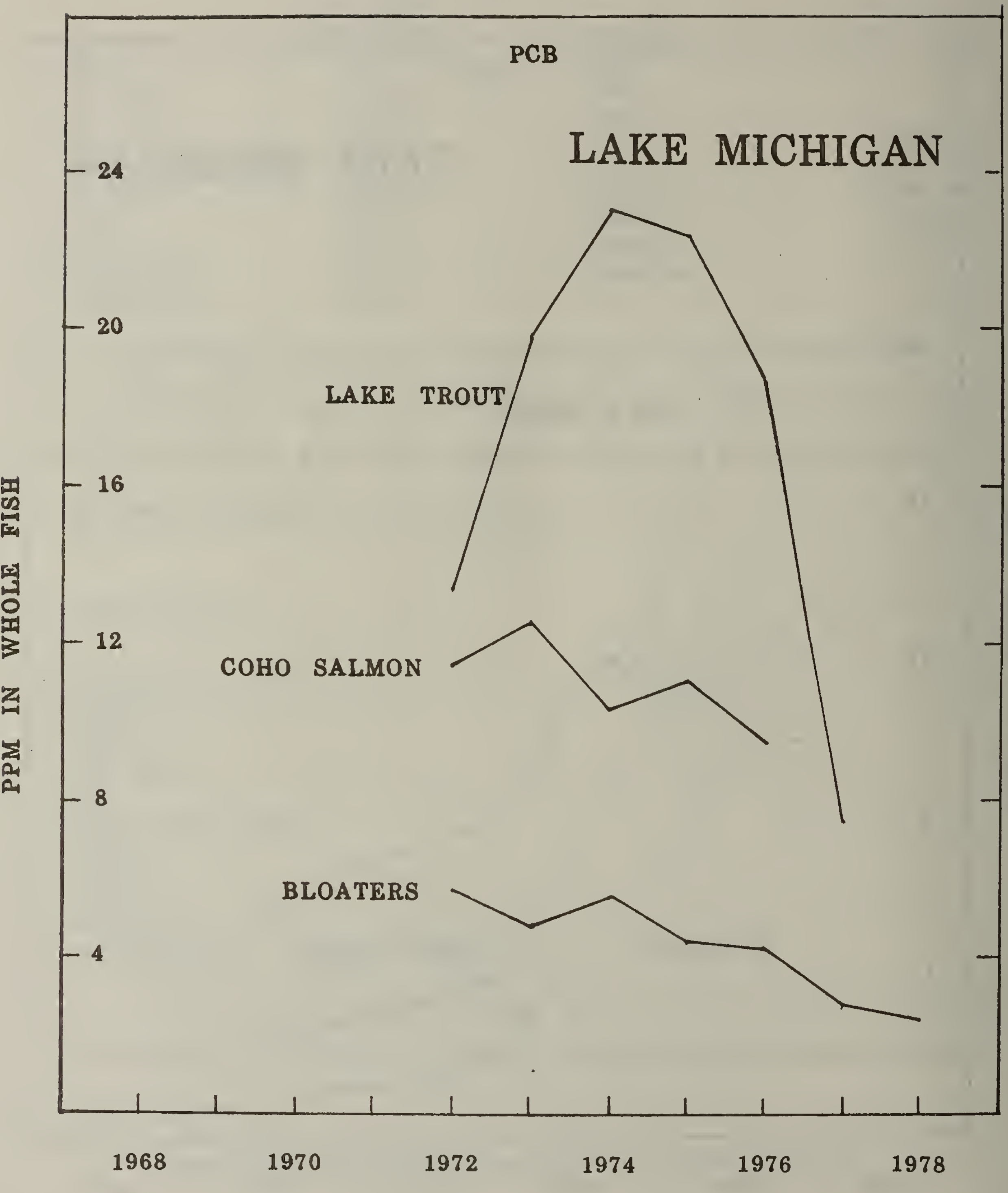
No detectable levels were observed at the other stations.

FIGURE 17



SOURCE: PROFILE OF ENVIRONMENTAL QUALITY, USEPA 1979.
REGION V THE MIDWEST

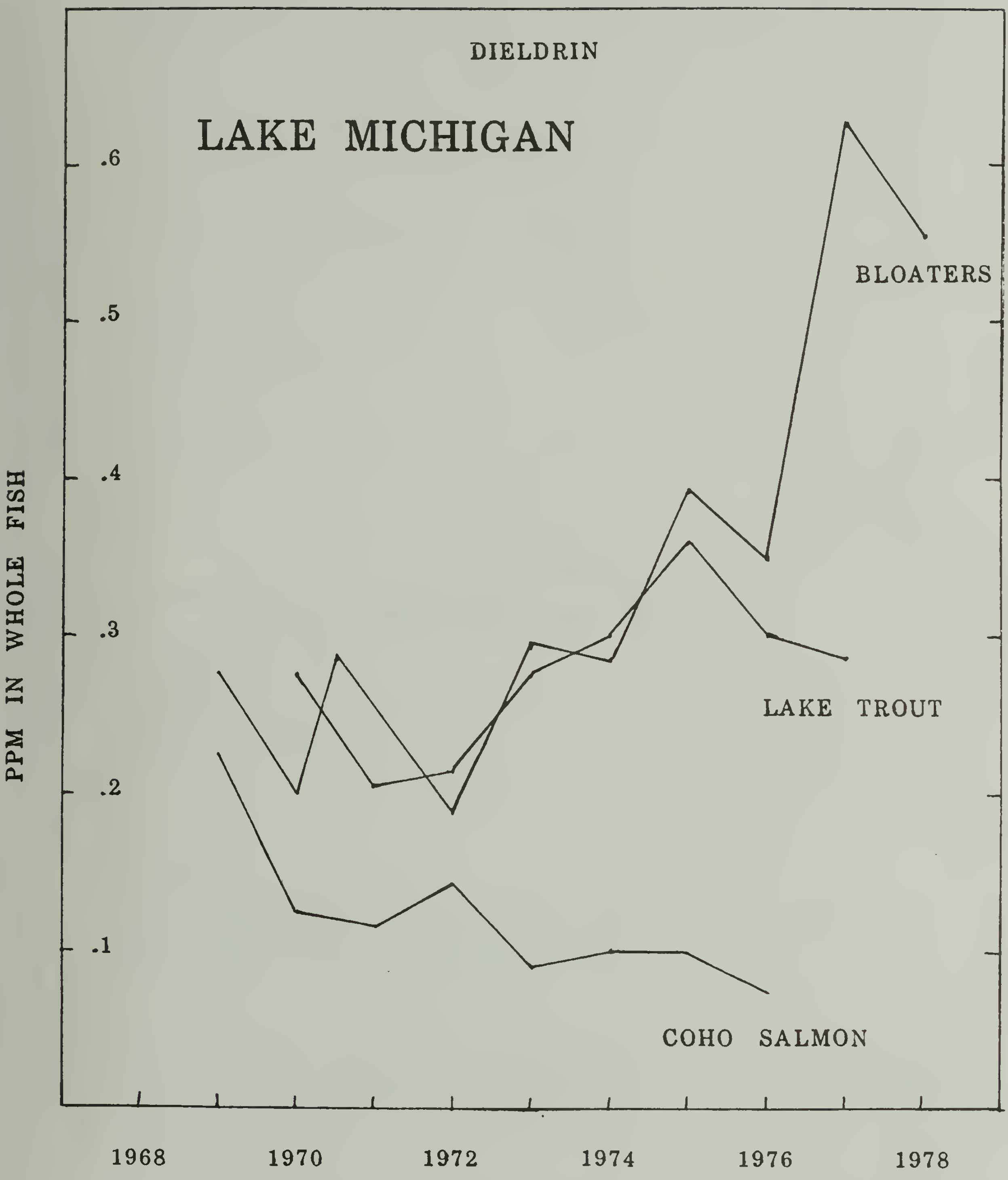
FIGURE 18



SOURCE: PROFILE OF ENVIRONMENTAL QUALITY, USEPA 1979.

REGION V THE MIDWEST

FIGURE 19



SOURCE: PROFILE OF ENVIRONMENTAL QUALITY, USEPA 1979.
REGION V THE MIDWEST

Appendix A

INDIVIDUAL SURVEY DATA SHEETS

TABLE 7

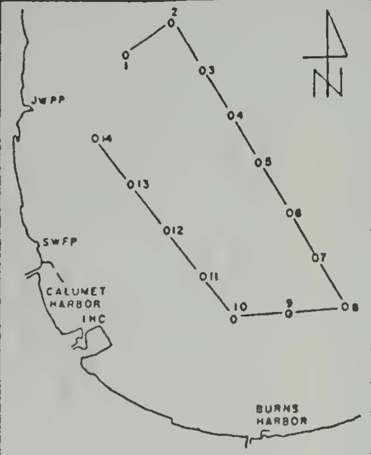
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE March 27, 19 79



PARAMETER	STORET NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0903	0921	0939	0957	1015	1033	1051	1109	1127	1145	1203	1221	1239	1257
TEMPERATURE °C	00010	1	1	1	1	1·	1	1	1	2	2	2	2	2	2
TURBIDITY F.T.U.	00076	0.90	0.50	0.45	0.50	0.45	0.50	0.55	2.3	2.3	2.7	0.90	2.5	0.90	1.8
ODOR, THRESHOLD	00086	2DE	2M	2M	1M	1M	1M	1M	2M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.2	8.2	8.2	8.2	8.3	8.3	8.3	8.2	8.3
SULFATE mg/l	00945	23.5	23.0	23.0	23.5	20.5	20.5	21.0	21.5	21.0	21.5	21.0	22.5	21.5	21.5
CHLORIDE mg/l	00940	9.0	8.6	8.6	11.2	9.4	8.8	8.4	8.8	8.6	8.6	8.8	8.6	8.8	8.8
PHOSPHATE, TOTAL mg/l	00650	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.24	0.01
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.16	<0.01
SILICA mg/l	00956	0.9	0.9	0.9	1.2	0.9	1.0	1.0	1.0	0.9	0.8	0.8	0.8	1.0	1.1
POTASSIUM mg/l	00937	1.3	1.3	1.3	1.2	1.2	1.3	1.3	1.3	1.5	1.3	1.3	1.5	1.3	1.5
SODIUM mg/l	00929	4.1	4.1	4.6	4.3	4.3	5.0	5.6	5.0	4.3	5.0	5.6	5.4	5.4	5.0
CONDUCTIVITY μ mhos	00095	300	295	295	295	295	300	300	300	305	305	305	300	310	310
RESIDUE, FILTRABLE mg/l	00515	155	157	154	160	169	171	154	153	159	158	154	157	161	157
RESIDUE, NONFILTRABLE mg/l	00530	2	1	1	4	2	1	7	6	1	4	6	2	2	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.5	3.4	3.4	12.3	4.7	3.4	8.5	9.4	6.6	8.5	7.5	6.6	3.4	4.7
NITROGEN, AMMONIA mg/l	00610	0.01	0.13	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.23	0.23	0.23	0.22	0.23	0.23	0.24	0.23	0.23	0.23	0.26	0.33	0.34
NITROGEN, ORGANIC mg/l	00605	0.16	0.12	0.16	0.12	0.12	0.12	0.12	0.08	0.16	0.16	0.08	0.08	0.08	0.08
PLATE COUNT 48hr., 35°C PER ml.	31753	13	3	1	1	1	4	2	2	1	1	1	1	0	3
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	240	60	120	100	80	80	120	220	100	140	0	200	120	360
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	2	0	0	0	0	0	0	0	1	0	0	0
FUNGI PER ml.	31856	1	0	0	1	0	0	0	0	0	0	0	0	1	0
ASBESTOS PER l.	00948														

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200		
DIRECTION	00036	NW	N	N	NE	NE		
VELOCITY	00035	3	5	5	6	6		

PREVAILING WIND 00036 N

SURVEY BY. J. Esposito & J. Shadle

REMARKS.

TABLE 8

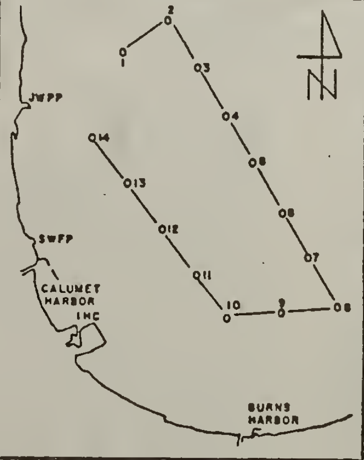
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE May 30, 19 79



PARAMETER	STORET NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0906	0924	0942	1000	1018	1036	1054	1112	1130	1148	1206	1224	1242	1300
TEMPERATURE °C	00010	10	8	8	8	8	8	8	9	10	10	10	10	10	11
TURBIDITY F.T.U.	00076	0.55	0.45	0.55	0.50	0.45	0.45	0.45	0.35	0.40	0.40	0.35	0.45	0.40	0.45
ODOR, THRESHOLD	00086	20f	10f	1M	1M	2M	1M	1DM	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	22.5	22.0	22.0	22.5	22.8	22.8	22.5	22.5	22.3	22.8	22.0	22.5	22.0	23.0
CHLORIDE mg/l	00940	10.8	10.6	10.6	10.5	10.8	10.8	10.8	10.8	10.8	11.0	11.0	11.0	11.0	11.0
PHOSPHATE, TOTAL mg/l	00650	0.02	0.01	0.01	0.02	0.02	0.01	0.03	0.08	0.03	0.06	0.01	0.02	0.01	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.01	<0.01	<0.01	0.01	0.02	<0.01	0.02	0.02	0.01	0.03	0.01	<0.01	<0.01	<0.01
SILICA mg/l	00956	0.9	0.6	0.6	1.1	0.6	0.9	0.9	0.9	0.9	0.9	0.6	0.9	1.1	1.1
POTASSIUM mg/l	00937	1.0	0.9	0.8	0.9	0.8	0.8	0.8	0.9	1.0	1.0	1.0	1.0	1.0	1.0
SODIUM mg/l	00929	4.5	4.5	4.5	4.5	4.7	4.2	4.5	4.2	4.2	4.5	4.2	4.2	4.5	4.5
CONDUCTIVITY μ mhos	00095	290	290	290	285	285	295	295	295	295	295	300	300	295	300
RESIDUE, FILTRABLE mg/l	00515	164	159	159	159	160	158	157	155	157	163	167	157	156	159
RESIDUE, NONFILTRABLE mg/l	00530	3	1	1	4	1	6	4	5	6	1	1	7	1	5
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.8	4.8	4.8	6.8	6.8	4.8	5.8	6.8	4.8	4.8	6.8	7.8	6.8	7.8
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.27	0.26	0.20	0.23	0.24	0.25	0.24	0.23	0.23	0.24	0.24	0.26	0.25	0.25
NITROGEN, ORGANIC mg/l	00605	0.16	0.07	0.12	0.16	0.12	0.10	0.16	0.12	0.20	0.20	0.07	0.16	0.16	0.07
									-						
PLATE COUNT 48hr., 35°C PER ml.	31753	330	40	300	34	36	26	3	16	16	10	8	11	8	13
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	80	20	180	160	60	40	20	20	60	480	20	120	280	1700
ACTINOS 14 DAY, 26°C PER ml.	80148	1	1	0	0	0	0	1	0	0	0	1	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASBESTOS PER l.	00948														

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300
DIRECTION	00036	NW	N	E	E	E	E
VELOCITY	00035	5	5	2	2	2	5

PREVAILING WIND	
00036	E

SURVEY BY: J. Esposito

REMARKS:

TABLE 9

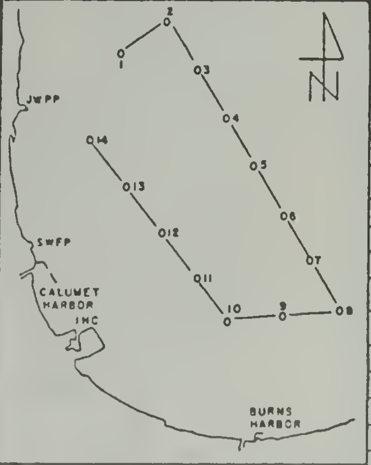
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE Aug. 23, 19 79



PARAMETER	STORET NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		SAMPLING POINT AND STATION NUMBER													
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0906	0924	0942	1000	1018	1036	1054	1112	1130	1148	1206	1224	1242	1300
TEMPERATURE °C	00010	21	21	21	21	21	20	20	20	21	21	21	21	21	21
TURBIDITY F.T.U.	00076	0.55	0.55	0.55	0.50	0.45	0.50	0.35	0.35	0.35	0.45	0.40	0.50	0.55	0.45
ODOR, THRESHOLD	00086	2M	1M	1M	1M	1M	1M	10M	1M	1M	1M	1M	1M	10M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	22.5	23.3	22.5	22.3	22.0	21.7	22.5	22.0	22.0	22.5	22.0	21.5	22.3	22.3
CHLORIDE mg/l	00940	10.6	10.8	10.2	10.0	10.2	10.4	10.4	10.2	10.2	10.0	10.4	10.0	10.0	10.2
PHOSPHATE, TOTAL mg/l	00650	0.07	0.02	0.02	0.02	0.02	0.01	0.03	0.02	0.07	0.02	0.02	0.02	0.01	0.01
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	0.04	<0.01	0.01	0.01	<0.01	<0.01
SILICA mg/l	00956	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
POTASSIUM mg/l	00937	1.1	1.1	1.1	1.2	1.0	0.9	1.1	1.1	1.2	1.0	1.1	0.9	1.1	1.1
SODIUM mg/l	00929	4.8	5.0	5.0	5.0	5.0	4.9	4.9	5.0	4.8	4.8	4.6	5.0	5.0	5.0
CONDUCTIVITY µ mhos	00095	285	290	290	290	290	285	285	285	280	285	285	285	285	290
RESIDUE, FILTRABLE mg/l	00515	178	186	185	176	188	176	156	172	173	178	175	168	181	172
RESIDUE, NONFILTRABLE mg/l	00530	1	0	4	1	3	4	4	3	1	0	2	2	7	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	12.0	6.0	12.0	10.0	10.0	9.0	9.0	10.0	10.0	12.0	10.0	8.0	10.0	16.0
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.25	0.23	0.24	0.26	0.26	0.22	0.20	0.23	0.24	0.20	0.20	0.19	0.21	0.23
NITROGEN, ORGANIC mg/l	00605	0.12	0.12	0.12	0.12	0.16	0.12	0.12	0.12	0.16	0.16	0.16	0.16	0.20	0.20
PLATE COUNT 48hr., 35°C PER ml.	31753	22	10	18	4	1	2	8	0	1	4	2	1	0	4
MF-TC PER 100 ml	31503	8	8	0	0	2	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml	60050	100	120	40	80	40	40	140	20	0	100	20	40	0	0
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	1	0	1	0	0	0
ASBESTOS PER l	00948	-	2.36×10^5	-	3.27×10^5	-	1.03×10^5	-	2.75×10^5	-	-	-	-	-	-

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300	
DIRECTION	00036	S	SW	SW	S	S	S	
VELOCITY	00035	6	8	7	6	7	8	

PREVAILING WIND	SURVEY BY. J.E. & J.V.
00036	REMARKS.
S	*2, *4, *6, *8: Asbestos Sample

TABLE 10

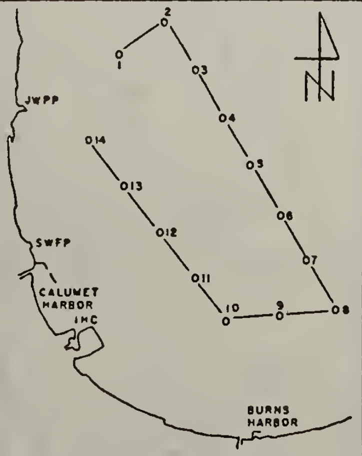
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

CHICAGO-LAKE MICHIGAN OPEN WATER SURVEY

DATE October 18, 1979



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		CHW201	CHW202	CHW203	CHW204	CHW205	CHW206	CHW207	CHW208	CHW209	CHW210	CHW211	CHW212	CHW213	CHW214
TIME		0907	0925	0943	1001	1019	1037	1055	1113	1131	1149	1207	1225	1243	1301
TEMPERATURE °C	00010	13	13	13	13	13	14	14	14	14	14	14	14	14	14
TURBIDITY F.T.U.	00076	0.55	0.50	0.45	0.45	0.45	0.40	0.45	0.50	0.50	0.65	0.55	0.85	0.55	0.70
ODOR, THRESHOLD	00086	1M	1M	1M	2M	1M	1M	2M	1M	1M	1M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	20.0	20.5	20.5	21.0	21.5	23.0	21.5	22.8	22.0	20.5	21.0	21.0	21.0	20.4
CHLORIDE mg/l	00940	6.6	7.4	7.6	8.0	7.8	7.8	7.8	7.8	8.0	7.8	7.8	7.8	8.0	8.0
PHOSPHATE, TOTAL mg/l	00650	0.03	0.05	0.04	0.04	0.07	0.09	0.12	0.04	0.04	0.07	0.04	0.06	0.06	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.03	<0.01	0.03	0.03	0.04	0.04	<0.01	0.02	0.03	0.02	0.03	0.03	0.01
SILICA mg/l	00956	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
POTASSIUM mg/l	00937	0.8	1.0	1.1	0.9	0.9	1.1	1.2	1.0	1.0	0.9	1.0	1.0	1.0	1.1
SODIUM mg/l	00929	4.4	4.2	4.3	4.3	4.2	4.4	4.4	4.3	4.3	4.3	4.5	4.5	4.5	4.3
CONDUCTIVITY µ mhos	00095	290	285	280	280	280	280	285	280	280	280	280	280	280	280
RESIDUE, FILTRABLE mg/l	00515	161	154	156	155	163	164	153	157	158	159	158	150	169	164
RESIDUE, NONFILTRABLE mg/l	00530	15	13	4	1	0	2	12	6	12	11	7	5	4	12
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.6	4.8	4.8	3.8	3.8	3.8	1.9	6.7	7.6	3.8	3.8	3.8	7.6	10.5
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.18	0.19	0.18	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.16	0.16	0.17	0.17
NITROGEN, ORGANIC mg/l	00605	0.020	0.020	0.020	0.020	0.020	0.017	0.020	0.015	0.020	0.020	0.020	0.015	0.020	0.020
PLATE COUNT 48hr., 35°C PER ml.	31753	4	0	1	0	0	0	4	2	1	4	3	270	0	10
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050														
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	1	0	0	1	0	0	0	0	0	0	0	0	0
ASBESTOS PER l.	00948	-		-		-		-		-	-	-	-	-	-

METEOROLOGICAL DATA

TIME		0800	0830	1000	1100	1200	1300
DIRECTION	00036	N W	E	SE	SE	E	E
VELOCITY	00035	0	1	2	1	3	2

PREVAILING WIND E

SURVEY BY: J. Esposito/J. Vencill

00036

REMARKS:

TABLE 11

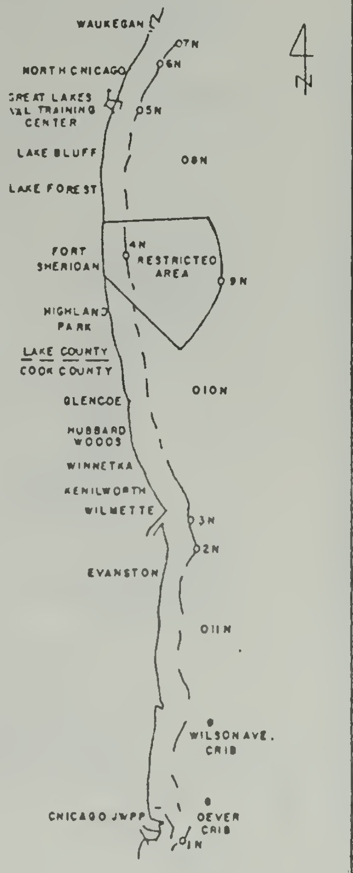
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE April 5, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012	
TIME		0842	0939	0950	1109	1116	1123	1054	1031	1012	0922	
TEMPERATURE °C	00010	4	3	3	3	3	2	2	2	2	3	
TURBIDITY F.T.U.	00076	7.4	2.1	2.1	7.8	6.7	6.9	3.3	1.8	2.2	1.7	
ODOR, THRESHOLD	00086	2M	1M	1M	1M	1M	1M	1M	1M	1M	1M	
pH	00400	8.3	8.3	8.3	8.2	8.2	8.2	8.2	8.3	8.3	8.3	
SULFATE mg/l	00945	26.0	24.3	24.0	26.8	26.5	26.5	24.5	24.0	27.0	24.0	
CHLORIDE mg/l	00940	10.2	11.2	13.0	14.2	15.0	15.2	12.0	12.0	13.0	10.0	
PHOSPHATE, TOTAL mg/l	00650	0.05	0.04	0.04	0.05	0.05	0.05	0.04	0.03	0.05	0.04	
PHOSPHATE, DISSOLVED mg/l	00653	0.03	0.02	0.02	0.03	0.02	0.03	0.02	0.02	0.03	0.03	
CONDUCTIVITY μ mhos	00095	325	350	315	330	340	340	315	315	330	350	
RESIDUE, NONFILTRABLE mg/l	00530	2	5	3	4	1	3	1	2	4	4	
OXYGEN DEMAND, CHEMICAL mg/l	00335	10.3	6.5	4.7	12.1	2.8	11.2	7.5	5.6	8.4	3.7	
NITROGEN, AMMONIA mg/l	00610	0.02	0.02	0.02	0.06	0.07	0.06	0.06	0.05	0.03	0.02	
NITROGEN, NITRITE-NITRATE mg/l	00630	0.22	0.21	0.25	0.33	0.29	0.29	0.20	0.22	0.30	0.24	
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.12	0.12	0.16	0.16	0.16	0.16	0.12	
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
PLATE COUNT 48 hr, 35 °C PER ml.	31753	110	300	210	800	600	310	150	66	250	130	
MF-TC PER 100 ml.	31503	0	0	0	64	12	28	4	0	0	0	
MF-FC PER 100 ml.	31616	0	0	0	0	0	10	0	0	0	0	
MF-FS PER 100 ml.	31679	0	-	0	8	-	4	-	0	-	0	
PLANKTON PER ml.	60050	440	1840	1720	340	520	340	720	720	600	820	
ACTINOS 14 DAY, 26°C PER ml.	80148	2	10	3	3	2	2	4	3	2	0	
FUNGI PER ml.	31856	0	0	1	2	4	4	0	0	0	0	

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SW	S	S	SW				S
VELOCITY	00035	9	13	17	21				

SURVEY BY J. Esposito & J. Snadle

REMARKS

TABLE 12

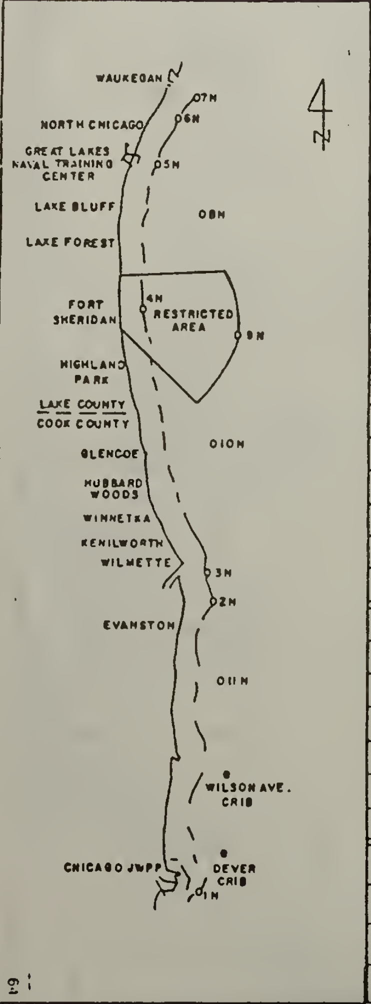
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE May 22, 19 79



PARAMETER		STORET NUMBER	SAMPLING POINT AND STATION NUMBER									
			1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012
TIME			0840	0938	0947	1107	1114	1120	1051	1028	1009	0920
TEMPERATURE	°C	00010	11	10	10	10	10	10	10	9	9	10
TURBIDITY	F.T.U.	00076	0.90	0.50	0.55	0.50	0.55	0.85	0.50	0.50	0.50	0.45
ODOR, THRESHOLD		00086	3Df	2Df	2Df	2Df	2Df	2M	2DM	2DM	2DM	2M
pH		00400	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE	mg/l	00945	20.5	20.0	20.4	20.0	21.0	23.2	24.8	24.3	23.8	23.5
CHLORIDE	mg/l	00940	10.2	9.8	9.0	9.0	8.8	9.8	8.8	8.6	9.0	8.8
PHOSPHATE, TOTAL	mg/l	00650	0.04	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	0.01	0.01
PHOSPHATE, DISSOLVED	mg/l	00653	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CONDUCTIVITY	µ mhos	00095	295	295	290	305	300	300	295	295	295	295
RESIDUE, NONFILTRABLE	mg/l	00530	1	2	5	3	1	1	1	3	2	3
OXYGEN DEMAND, CHEMICAL	mg/l	00335	8.7	5.8	12.6	6.8	2.9	6.8	5.8	3.9	14.6	8.7
NITROGEN, AMMONIA	mg/l	00610	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE	mg/l	00630	0.20	0.22	0.22	0.24	0.26	0.24	0.24	0.23	0.24	0.21
NITROGEN, ORGANIC	mg/l	00605	0.28	0.16	0.12	0.16	0.24	0.16	0.16	0.16	0.28	0.12
PHENOL-LIKE SUBSTANCES	µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.		31753	78	26	17	13	18	24	16	18	23	23
MF-TC PER 100 ml.		31503	0	0	0	0	0	2	0	0	0	0
MF-FC PER 100 ml.		31616	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml.		31679	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.		60050	1820	1460	1840	1260	1060	1540	1040	880	1160	1540
ACTINOS 14 DAY, 26°C PER ml.		80148	0	0	0	3	2	5	1	0	0	0
FUNGI PER ml.		31856	0	0	0	0	0	0	0	0	1	0

METEOROLOGICAL DATA

								PREVAILING WIND
TIME		0800	0900	1000	1100			00036
DIRECTION	00036	E	SE	E	E			E
VELOCITY	00035	4	4	3	6			

SURVEY BY: J. Esposito / K. Rudmin

REMARKS:

TABLE 13

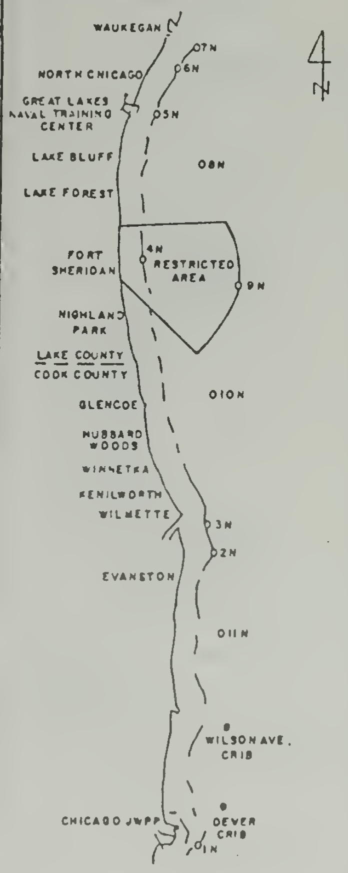
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE June 12, 1979



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1N CHW013	2N CHW011	3N CHW010	5N CHW005	6N CHW004	7N CHW003	8N CHW006	9N CHW008	10N CHW009	11N CHW012	
TIME		0836	0934	0939	1103	1110	1118	1043	1020	1001	0916	
TEMPERATURE °C	00010	15	13	13	11	11	11	9	9	12	13	
TURBIDITY F.T.U.	00076	0.80	0.55	0.65	0.80	0.75	0.75	0.70	0.60	0.50	0.60	
ODOR, THRESHOLD	00086	3Df	2Df	2M	2M	2M	2M	2M	1M	1M	1M	
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.2	8.3	8.3	
SULFATE mg/l	00945	22.5	22.5	22.5	22.5	22.5	22.8	22.5	22.5	22.5	22.0	
CHLORIDE mg/l	00940	10.2	10.2	10.0	9.8	10.0	10.0	9.8	10.0	10.4	10.8	
PHOSPHATE, TOTAL mg/l	00650	0.04	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	0.01	0.01	
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
CONDUCTIVITY µ mhos	00095	290	300	295	295	295	300	290	295	290	295	
RESIDUE, NONFILTRABLE mg/l	00530	4	1	2	1	1	1	3	5	1	1	
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.9	6.9	7.9	8.9	8.9	9.9	6.9	8.9	10.9	9.9	
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.23	0.22	0.23	0.23	0.24	0.23	0.25	0.23	0.23	
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.12	0.16	0.16	0.16	0.16	0.12	0.12	0.16	
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
PLATE COUNT 48 hr., 35°C PER ml.	31753	30	12	4	2	9	9	2	7	4	6	
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	
MF-FS PER 100 ml.	31679	0	-	0	0	-	0	-	0	-	0	
PLANKTON PER ml.	60050	520	700	1320	520	1120	720	160	840	300	320	
ACTINOS 14 DAY, 26°C PER ml.	80148	2	0	1	1	1	1	0	0	1	0	
FUNGI PER ml	31856	0	0	0	0	1	0	0	0	0	0	

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200	1300		00036
DIRECTION	00036	E	E	E	E	NE	NE		E
VELOCITY	00035	1	2	2	3	3	3		

SURVEY BY M. Kplanynycky & K. Rudnin

REMARKS

TABLE 14

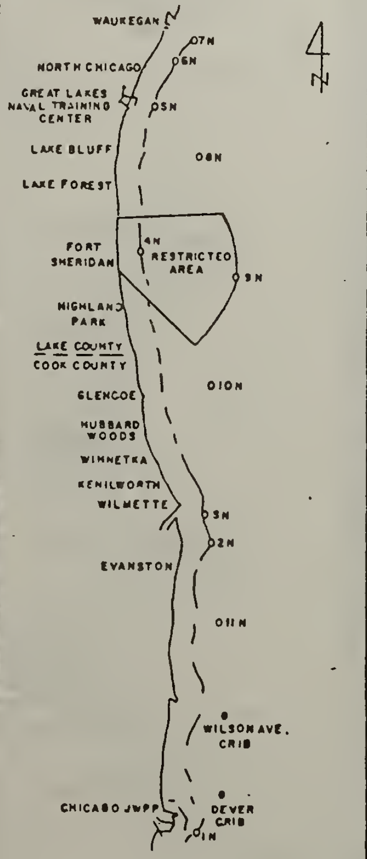
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE July 10, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1N	2N	3N	5N	6N	7N	8N	9N	10N	11N	
		CHW013	CHW011	CHW010	CHW005	CHW004	CHW003	CHW006	CHW008	CHW009	CHW012	
TIME		0824	0903	0920	0931	0953	1012	1035	1053	1100	1107	
TEMPERATURE °C	00010	19	19	19	20	19	18	18	20	19	19	
TURBIDITY F.T.U.	00076	0.80	0.80	0.95	0.60	0.45	0.50	0.40	0.35	0.65	0.60	
ODOR, THRESHOLD	00086	2M	1M	2DM	3Df	2DM	2DM	2M	1M	2Df	2M	
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	
SULFATE mg/l	00945	21.0	23.0	23.5	22.8	22.0	22.0	21.5	21.5	22.8	21.3	
CHLORIDE mg/l	00940	10.2	10.8	10.4	10.6	10.6	10.4	9.8	9.8	10.2	10.0	
PHOSPHATE, TOTAL mg/l	00650	0.08	0.02	0.02	0.02	0.01	0.01	0.04	0.04	0.06	0.03	
PHOSPHATE, DISSOLVED mg/l	00653	0.04	<0.01	<0.01	0.01	<0.01	<0.01	0.03	0.03	<0.01	0.02	
CONDUCTIVITY µ mhos	00095	280	290	290	295	295	285	290	290	290	295	
RESIDUE, NONFILTRABLE mg/l	00530	4	1	1	2	3	2	3	1	5	2	
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.9	5.9	8.8	6.9	5.9	8.8	4.9	2.0	3.9	6.9	
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.24	0.23	0.22	0.22	0.22	0.21	0.22	0.23	0.22	
NITROGEN, ORGANIC mg/l	00605	0.16	0.14	0.12	0.14	0.14	0.16	0.12	0.20	0.16	0.18	
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
PLATE COUNT 48 hr., 35 °C PER ml.	31753	45	18	3	14	4	13	4	2	3	5	
MF-TC PER 100 ml.	31503	0	0	0	12	0	0	0	0	0	0	
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	
MF-FS PER 100 ml.	31679	0	0	0	0	0	0	0	0	2	0	
PLANKTON PER ml.	60050	1780	740	20	860	180	60	400	20	40	380	
ACTINOS 14 DAY, 26°C PER ml.	80148	0	2	0	4	0	1	0	1	0	0	
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	0	

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	SW	W	NE	E				E
VELOCITY	00035	1	2	1	3				

SURVEY BY J. Esposito & K. Rudmin

REMARKS

TABLE 15

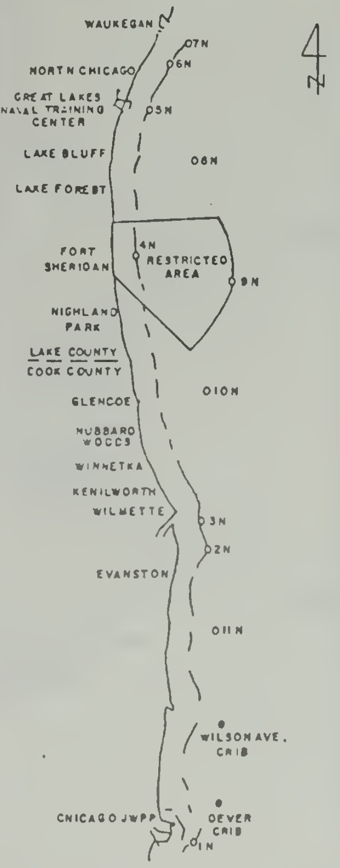
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

NORTH SHORE LAKE SURVEY

DATE Sept. 13, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1N	2N	3N	5N	6N	7N	8N	9N	10N	11N	
		CHW013	CHW011	CHW010	CHW005	CHW004	CHW003	CHW006	CHW008	CHW009	CHW012	
TIME		0830	0930	0938	1058	1105	1111	1042	1019	1000	0911	
TEMPERATURE °C	00010	19	18	19	19	19	19	19	19	18	18	
TURBIDITY F.T.U.	00076	1.4	1.3	1.3	1.0	1.2	1.3	0.55	0.45	0.55	1.4	
ODOR, THRESHOLD	00086	2Df	2M	1M	1M	2M	1M	2M	1M	1M	1M	
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	
SULFATE mg/l	00945	22.0	21.5	22.5	23.0	23.0	23.0	22.5	22.0	22.0	22.5	
CHLORIDE mg/l	00940	9.4	9.6	10.8	10.0	10.2	10.0	10.3	10.9	9.4	10.5	
PHOSPHATE, TOTAL mg/l	00650	0.07	0.05	0.02	0.03	0.07	0.08	0.08	0.02	0.08	0.03	
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	<0.01	<0.01	
CONDUCTIVITY µ mhos	00095	174	174	174	174	171	171	174	168	174	177	
RESIDUE, NONFILTRABLE mg/l	00530	3	1	8	4	8	2	5	2	4	8	
OXYGEN DEMAND, CHEMICAL mg/l	00335	4.0	5.9	10.9	11.9	12.9	13.9	10.9	8.9	10.9	10.9	
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	
NITROGEN, NITRITE-NITRATE mg/l	00630	0.19	0.20	0.20	0.18	0.19	0.19	0.19	0.19	0.19	0.20	
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.20	0.16	0.16	0.20	0.20	0.16	0.20	0.24	
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
PLATE COUNT 48 hr., 35 °C PER ml.	31753	48	8	12	11	10	8	12	2	8	6	
MF-TC PER 100 ml.	31503	0	0	0	0	4	0	0	0	0	2	
MF-FC PER 100 ml.	31616	0	0	0	0	2	0	0	0	0	2	
MF-FS PER 100 ml	31679	0	-	0	0	-	0	-	0	-	0	
PLANKTON PER ml.	60050	140	40	0	120	100	80	160	40	60	40	
ACTINOS 14 DAY, 26 °C PER ml.	80148	1	0	0	0	1	4	0	0	0	0	
FUNGI PER ml.	31856	0	0	2	0	1	0	0	0	0	0	

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100				00036
DIRECTION	00036	NW	NW	NW	NW				NW
VELOCITY	00035	8	8	10	13				

SURVEY BY: J. Esposito / J. Vencill

REMARKS

TABLE 16

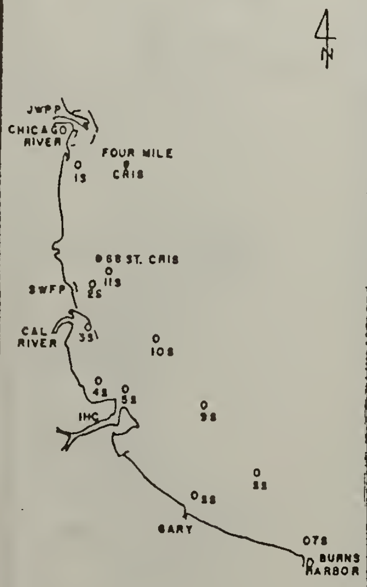
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE MARCH 22, 19 79



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0849	0923	0935	0953	1001	1037	1109	1132	1155	1218	1241
TEMPERATURE °C	00010	3	3	4	5	10	3	3	3	2	3	3
TURBIDITY F.T.U.	00076	2.3	0.70	0.80	1.7	3.7	0.85	1.3	0.70	0.70	0.70	0.80
ODOR THRESHOLD	00086	1M	1M	1M	2M	4Cn	1M	1M	1M	1M	1M	1M
pH	00400	8.2	8.2	8.3	8.2	8.0	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	27.0	26.5	29.0	38.0	70.5	33.0	33.0	26.0	25.5	27.0	27.0
CHLORIDE mg/l	00940	10.4	10.2	11.8	15.5	27	13.2	11.6	11.0	10.5	11.2	11.2
PHOSPHATE, TOTAL mg/l	00650	0.04	0.04	0.03	0.11	0.13	0.05	0.03	0.04	0.03	0.03	0.01
PHOSPHATE, DISSOLVED mg/l	00653	0.03	0.03	0.02	0.06	0.10	0.01	0.01	0.01	0.01	0.01	<0.01
CONDUCTIVITY µ mhos	00095	320	320	335	370	475	340	333	320	310	330	320
RESIDUE, NONFILTRABLE mg/l	00530	5	1	4	3	4	1	2	5	3	6	1
OXYGEN DEMAND, CHEMICAL mg/l	00335	5.7	10.4	5.7	15.2	17.1	5.7	4.8	9.5	8.6	16.2	7.6
NITROGEN, AMMONIA mg/l	00610	0.01	0.01	0.04	0.26	1.50	0.10	0.04	0.02	0.01	0.03	0.03
NITROGEN, NITRITE-NITRATE mg/l	00630	0.28	0.25	0.28	0.33	0.43	0.31	0.28	0.25	0.24	0.23	0.27
NITROGEN, ORGANIC mg/l	00605	0.24	0.20	0.36	0.24	0.28	0.20	0.16	0.20	0.24	0.20	0.16
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	3	18	290	1900	40000	22	240	3	8	190	8
MF-TC PER 100ml.	31503	0	40	120	5600	7900	0	256	0	0	300	0
MF-FC PER 100ml.	31616	0	0	0	1300	1700	0	16	0	0	2	0
MF-FS PER 100ml.	31679	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	80	60	80	60	80	80	280	180	1000	420	420
ACTINOS 14 DAY, 26°C PER ml.	80148	2	0	3	6	0	16	18	1	C	1	1
FUNGI PER ml.	31856	0	1	0	1	2	1	2	0	0	0	0

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	N	N	NE	NE	NW			N
VELOCITY	00038	2	1	1	1	1			

SURVEY BY: M. Knianynycky & J. Esposito

REMARKS:

5S: Dark Plume to North

TABLE 17

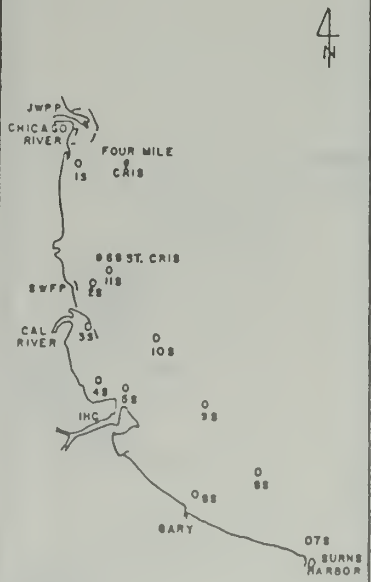
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND, SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE May 15, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
		CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME		0840	0914	0927	0942	0951	1024	1054	1117	1140	1203	1226
TEMPERATURE °C	00010	10	11	11	11	10	10	8	8	8	10	11
TURBIDITY F.T.U.	00076	0.45	0.40	0.85	0.55	0.55	0.45	0.35	0.50	0.45	0.40	0.45
ODOR, THRESHOLD	00086	3Df	2DM	2DM	2DM	2DM	1DM	2Df	2DM	2M	1M	1M
pH	00400	8.4	8.4	8.3	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.5
SULFATE mg/l	00945	24.5	24.5	25.0	24.0	24.5	24.0	23.3	22.5	22.5	23.0	23.2
CHLORIDE mg/l	00940	11.8	11.6	11.6	11.2	11.0	10.8	10.0	10.0	10.4	11.6	11.0
PHOSPHATE, TOTAL mg/l	00650	0.02	0.02	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.04
PHOSPHATE, DISSOLVED mg/l	00653	0.01	0.01	0.01	<0.01	0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01
CONDUCTIVITY µ mhos	00095	290	295	305	285	290	295	285	290	285	290	290
RESIDUE, NONFILTRABLE mg/l	00530	4	6	5	5	3	3	1	5	2	3	1
OXYGEN DEMAND, CHEMICAL mg/l	00335	6.2	8.2	9.3	7.2	7.2	8.2	8.2	8.2	6.2	6.2	3.1
NITROGEN, AMMONIA mg/l	00610	0.01	0.02	0.03	0.02	0.02	0.03	0.02	0.02	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.22	0.23	0.21	0.22	0.22	0.21	0.21	0.20	0.21	0.22
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.20	0.20	0.08	0.12	0.16	0.20	0.12	0.12	0.20
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	22	120	8400	140	370	250	40	160	42	5	16
MF-TC PER 100ml.	31503	0	0	16	156	142	8	2	6	0	0	0
MF-FC PER 100ml.	31616	0	0	4	4	8	4	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	1340	340	480	620	260	820	520	600	1180	1020	960
ACTINOS 14 DAY, 26°C PER ml.	80148	1	0	1	1	0	3	1	0	1	0	2
FUNGI PER ml.	31856	0	1	1	0	1	0	0	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	W	NW	N	NE	E			
VELOCITY	00038	8	7	4	4	3			

SURVEY BY: J. Esposito & J. Shadle

REMARKS:

TABLE 18

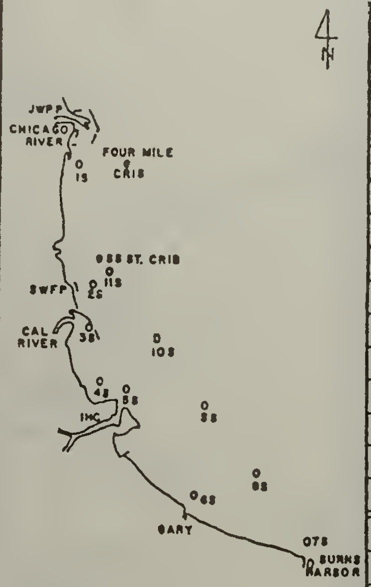
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE June 5, 1979



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S	2S	3S	4S	5S	6S	7S	8S	9S-	10S	11S
		CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME		0835	0908	0922	0938	0947	1022	1053	1116	1139	1202	1225
TEMPERATURE °C	00010	14	14	14	15	17	15	14	14	14	14	14
TURBIDITY F.T.U.	00076	0.70	0.55	0.85	0.85	0.85	0.80	0.55	0.45	0.60	0.55	0.50
ODOR, THRESHOLD	00086	2Df	1Df	2DM	1M	4Cn	2DM	2DM	2DF	2DM	1M	1M
pH	00400	8.3	8.3	8.4	8.3	8.1 *	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	23.8	24.0	25.5	25.5	36.5	28.5	26.0	25.5	28.0	25.0	25.0
CHLORIDE mg/l	00940	9.2	9.0	9.0	9.6	12.8	10.0	9.4	9.0	9.2	9.2	9.2
PHOSPHATE, TOTAL mg/l	00650	0.03	<0.01	0.04	0.05	0.09	0.04	0.04	<0.01	0.03	<0.01	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CONDUCTIVITY µ mhos	00095	290	300	305	305	350	320	305	305	310	295	300
RESIDUE, NONFILTRABLE mg/l	00530	1	2	2	1	1	3	1	3	3	3	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.9	8.9	10.9	11.9	12.9	7.9	7.9	8.9	4.0	11.9	10.9
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	0.01	0.05	0.40	0.11	<0.01	<0.01	0.05	<0.01	0.02
NITROGEN, NITRITE-NITRATE mg/l	00630	0.24	0.24	0.26	0.26	0.30	0.26	0.24	0.25	0.26	0.23	0.24
NITROGEN, ORGANIC mg/l	00605	0.20	0.15	0.20	0.20	0.25	0.25	0.20	0.20	0.15	0.20	0.12
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	8	15	2800	960	32000	4300	21	110	1300	6	1
MF-TC PER 100ml.	31503	0	0	0	0	790	24	0	0	0	0	0
MF-FC PER 100ml.	31616	0	0	0	0	128	20	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	2	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	360	240	500	540	280	640	600	1180	440	880	820
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	1	0	0	0	1	1	1	0	0
FUNGI PER ml.	31856	0	2	0	1	1	0	0	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	NW	N	N	NW	NW			NW
VELOCITY	00038	4	8	8	8	9			

SURVEY BY: J. Esposito & J. Snadle

REMARKS:

* Checked

TABLE 19

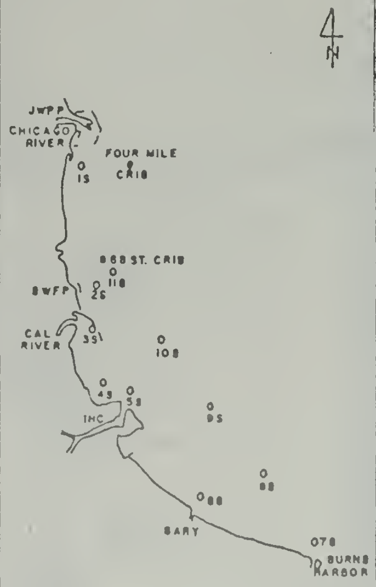
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE August 7, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
		CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME		0647	0920	0932	0949	0952	1033	1101	1124	1147	1210	1233
TEMPERATURE °C	00010	22	22	23	22	22	22	23	22	22	22	22
TURBIDITY F.T.U.	00076	0.55	0.70	1.7	0.80	0.75	0.60	0.50	0.40	0.30	0.55	0.35
ODOR, THRESHOLD	00086	1M	1M	2M	1M	2M	1M	1M	1M	2M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	22.0	23.3	23.0	23.5	24.5	24.0	23.0	23.5	22.0	23.0	21.7
CHLORIDE mg/l	00940	10.2	10.0	9.8	10.0	10.8	10.6	10.2	10.0	9.4	9.8	9.4
PHOSPHATE, TOTAL mg/l	00650	0.01	0.01	0.03	0.05	0.05	0.04	0.03	<0.01	0.03	0.03	0.03
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01
CONDUCTIVITY μ mhos	00095	285	290	295	295	300	300	295	295	290	295	295
RESIDUE, NONFILTRABLE mg/l	00530	1	1	4	2	4	2	1	2	2	1	1
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.8	6.8	8.7	12.6	4.9	6.8	6.8	7.8	7.8	13.6	1.9
NITROGEN, AMMONIA mg/l	00610	0.07	0.02	0.02	0.10	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.02
NITROGEN, NITRITE-NITRATE mg/l	00630	0.25	0.22	0.21	0.23	0.21	0.21	0.21	0.22	0.23	0.25	0.24
NITROGEN, ORGANIC mg/l	00605	0.14	0.17	0.18	0.20	0.22	0.14	0.14	0.10	0.22	0.28	0.18
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	14	29	780	2100	13000	1500	31	72	1	810	19
MF-TC PER 100ml.	31503	4	12	16	7300	2600	16	16	0	0	0	0
MF-FC PER 100ml.	31616	0	0	0	360	70	2	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	520	440	680	40	440	220	60	140	520	40	400
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	1	0	0	1	0	0	0	2	0
FUNGI PER ml.	31856	1	0	0	0	0	2	0	1	0	0	1

METEOROLOGICAL DATA									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	SW	SW	SW	SW	SW			SW
VELOCITY	00038	8	9	10	8	8			

SURVEY BY: J.E. & K.R.

REMARKS:

TABLE 20

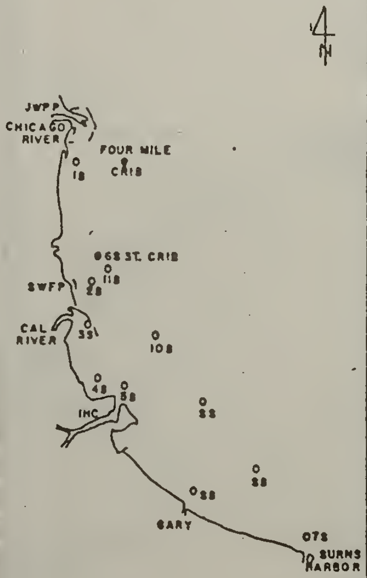
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE August 28, ,19 79



PARAMETER	STORET NUMBER	1S CHW014	2S CHW015	3S CHW017	4S CHW019	5S CHW020	6S CHW021	7S CHW024	8S CHW023	9S CHW022	10S CHW018	11S CHW016
TIME		0637	0918	0934	0949	1015	1053	1112	1151	1214	1237	1300
TEMPERATURE °C	00010	19	20	19	19	22	19	20	20	20	19	20
TURBIDITY F.T.U.	00076	0.50	0.65	0.90	0.70	2.8	0.80	0.80	0.70	0.55	0.65	0.55
ODOR, THRESHOLD	00086	10M	1M	10M	2M	4Ch	1M	20M	1M	10M	1M	1M
pH	00400	8.3	8.4	8.3	8.3	8.2	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	23.0	23.5	23.8	24.0	35.5	24.0	23.5	23.5	23.5	24.8	24.8
CHLORIDE mg/l	00940	10.2	10.2	10.2	10.0	16.2	10.4	10.0	9.8	9.8	9.8	10.0
PHOSPHATE, TOTAL mg/l	00650	0.07	0.06	0.05	0.06	0.21	0.03	0.08	0.06	0.05	0.05	0.03
PHOSPHATE, DISSOLVED mg/l	00653	0.03	0.01	<0.01	0.04	0.06	0.01	0.03	0.03	<0.01	0.03	0.01
CONDUCTIVITY μ mhos	00095	280	290	295	300	360	295	290	285	290	295	295
RESIDUE, NONFILTRABLE mg/l	00530	1	7	4	8	4	7	4	3	5	0	7
OXYGEN DEMAND, CHEMICAL mg/l	00335	17.0	22.3	7.4	12.7	8.5	8.5	8.5	5.3	5.3	8.5	4.2
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	0.03	<0.01	* 0.60	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.25	0.25	0.28	0.27	0.49	0.25	0.19	0.20	0.21	0.26	0.29
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.20	0.20	0.28	0.12	0.16	0.20	0.20	0.20	0.16
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	79	140	1300	1700	49000	510	1500	18	50	170	82
MF-TC PER 100ml.	31503	64	94	180	2200	1400	24	54	4	19	30	16
MF-FC PER 100ml.	31616	4	8	56	700	1300	2	6	0	0	0	0
MF-FS PER 100ml.	31679	0	0	6	6	60	0	0	0	0	0	0
PLANKTON PER ml.	60050	120	80	100	160	120	80	0	0	0	60	120
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	0	6	0	0	1	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	1	1	0	0	0	0	0

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300		PREVAILING WIND 00036
DIRECTION	00036	NW	NW	E	E	E	E		E
VELOCITY	00038	1	2	3	3	3	4		

SURVEY BY: J. Esposito

REMARKS:
* Repeated

TABLE 21

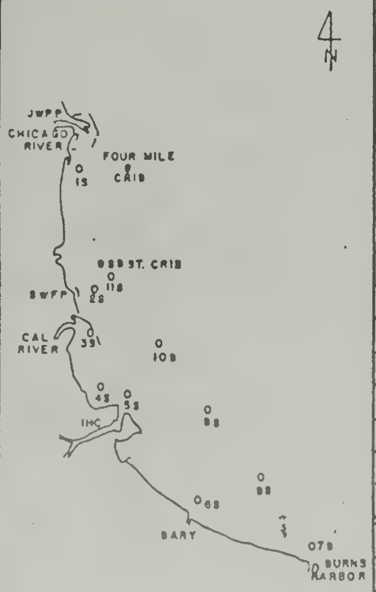
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

SOUTH SHORE LAKE SURVEY

DATE September 25, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER										
		1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	11S
		CHW014	CHW015	CHW017	CHW019	CHW020	CHW021	CHW024	CHW023	CHW022	CHW018	CHW016
TIME		0825	0858	0912	0929	0937	1015	1047	1110	1133	1156	1219
TEMPERATURE °C	00010	17	17	18	18	17	17	18	18	18	18	18
TURBIDITY F.T.U.	00076	2.7	1.5	2.4	1.4	1.1	0.90	1.0	0.75	1.2	0.80	1.3
ODOR, THRESHOLD	00086	2M	1M	10M	1M	1M	1M	2M	1M	1M	1M	1M
pH	00400	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4	8.4
SULFATE mg/l	00945	21.5	23.3	21.5	26.0	23.5	21.0	20.0	20.0	20.0	19.5	21.0
CHLORIDE mg/l	00940	9.8	10.1	10.1	10.2	10.2	10.1	10.1	10.1	10.1	10.1	10.1
PHOSPHATE, TOTAL mg/l	00650	0.06	0.06	0.06	0.07	0.04	0.04	0.05	0.06	0.07	0.07	0.05
PHOSPHATE, DISSOLVED mg/l	00653	0.03	0.01	0.02	0.03	0.01	0.01	0.03	<0.01	0.03	0.02	<0.01
CONDUCTIVITY µ mhos	00095	285	285	285	300	295	285	285	280	290	280	290
RESIDUE, NONFILTRABLE mg/l	00530	3	3	2	3	2	4	1	3	2	3	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	8.7	6.7	6.7	9.6	6.7	5.8	4.8	5.8	5.8	11.5	7.7
NITROGEN, AMMONIA mg/l	00610	<0.01	0.08	<0.01	0.08	0.06	<0.01	<0.01	<0.01	0.01	<0.01	0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.21	0.24	0.21	0.23	0.25	0.21	0.22	0.21	0.22	0.23	0.22
NITROGEN, ORGANIC mg/l	00605	0.16	0.16	0.16	0.16	0.16	0.16	0.12	0.16	0.20	0.12	0.12
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48 hr., 35°C PER ml.	31753	25	1900	1100	2300	4100	130	92	15	110	10	500
MF-TC PER 100ml.	31503	12	46	104	580	360	8	4	0	8	4	8
MF-FC PER 100ml.	31616	0	6	16	28	24	0	0	0	0	0	0
MF-FS PER 100ml.	31679	0	0	0	0	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	20	60	0	140	40	40	20	100	0	20	60
ACTINOS 14 DAY, 26°C PER ml.	80148	0	0	1	0	0	1	1	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA

									PREVAILING WIND
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	S	SE	NE	NE	E			NE
VELOCITY	00035	1	1	1	2	3			

SURVEY BY: J. Esposito & G. Slowik

REMARKS:

TABLE 22

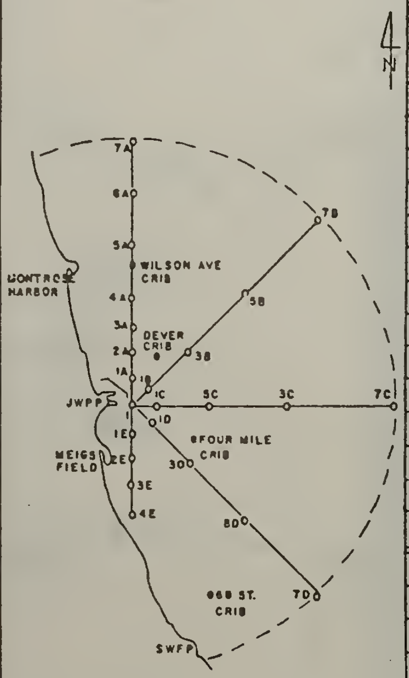
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

J.W.P.P. RADIAL LAKE SURVEY

DATE May 10, 19 79



PARAMETER	STORET NUMBER	1A CHW032	2A CHW047	3A CHW042	4A CHW057	5A CHW033	6A CHW029	7A CHW025	1B CHW083	3B CHW043	5B CHW034	7B CHW028	1C CHW064	5C CWH044	5C CHW035	7C CHW027	1D CHW035	3D CHW045	5D CHW038	7D CHW028	1E CHW056	2E CHW051	3E CHW048	4E CHW041
TIME		0831	0836	0840	0845	0854	0903	0912	1028	1019	1005	0947	1040	1049	1103	1121	1237	1228	1214	1156	1245	1249	1254	1259
TEMPERATURE °C	00010	11	12	13	13	13	12	13	13	11	10	8	12	13	8	7	13	13	12	9	12	12	13	13
TURBIDITY F.T.U.	00076	0.60	0.70	0.75	0.75	0.75	0.75	0.70	0.65	0.45	0.45	0.40	0.60	0.70	0.35	0.30	0.65	0.60	0.65	0.50	0.75	0.65	0.75	0.75
ODOR, THRESHOLD	00086	2M	1M	1M	1M	1M	1M	1M	2M	2M	1M	1M	2M	1M	1M	20f	1M	1M	1M	1M·	20M	2M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	20.7	22.0	22.0	23.5	23.0	22.5	23.5	22.0	22.0	20.5	20.3	22.5	22.3	20.3	20.0	23.0	22.5	21.5	21.0	22.0	22.7	23.5	23.5
CHLORIDE mg/l	00940	10.4	10.8	10.8	11.5	11.4	11.5	11.4	11.2	9.6	9.6	9.6	10.2	10.2	9.2	9.2	10.0	9.8	9.6	9.2	10.2	9.8	11.2	11.6
PHOSPHATE, TOTAL mg/l	00650	0.05	0.04	0.03	0.03	0.04	0.02	0.02	0.02	0.05	0.03	0.03	0.06	0.03	0.02	0.03	0.05	0.05	0.03	0.03	0.02	0.02	0.02	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	<0.01	0.03	0.02	0.01	0.02	0.02	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CONDUCTIVITY μ mhos	00095	285	300	310	315	315	310	315	310	300	290	305	290	310	290	290	305	300	310	290	300	300	300	305
RESIDUE, NONFILTRABLE mg/l	00530	2	6	7	7	2	5	4	4	3	5	3	4	3	6	3	6	2	5	3	6	5	5	4
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.3	5.2	11.3	9.3	7.2	11.3	16.5	7.2	7.2	1.0	7.2	10.3	10.3	5.2	8.2	7.2	7.2	8.2	6.2	6.2	5.2	9.3	10.3
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.23	0.24	0.26	0.29	0.28	0.28	0.29	0.26	0.25	0.25	0.23	0.25	0.26	0.20	0.19	0.25	0.23	0.24	0.20	0.24	0.23	0.25	0.25
NITROGEN ORGANIC mg/l	00605	0.16	0.12	0.16	0.16	0.16	0.12	0.12	0.08	0.12	0.16	0.08	0.12	0.08	0.16	0.16	0.16	0.12	0.12	0.12	0.16	0.12	0.16	0.12
IRON, TOTAL μg/l	01045	26	15	15	18	15	18	15	18	15	18	10	18	15	15	18	10	10	10	10	10	18	18	20
PHENOL-LIKE SUBSTANCES μg/l	32730	1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.	31753	8	15	34	56	24	10	62	35	4	0	2	82	31	0	0	7	26	56	5	0	18	72	120
MF-TC PER 100 ml.	31503	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	3420	-	2700	-	3310	-	1480	780	2040	780	1160	2440	1360	800	700	720	2080	1640	1580	1380	-	2320	-
ACTINOS 14 DAY, 26°C PER ml	80148	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	4	0	1	0	0	0
FUNGI PER ml.	31856	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

METEOROLOGICAL DATA

								PREVAILING WINDS
TIME		0800	0900	1000	1100	1200	1300	00036
DIRECTION	00036	SE	S	S	S	S	S	S
VELOCITY	00035	6	6	7	8	9	7	

SURVEY BY: J. Esposito & J. Shadle

REMARKS:
7A: Light oil streaks
3B: more oil streaks
7D: Large dark plume

TABLE 23

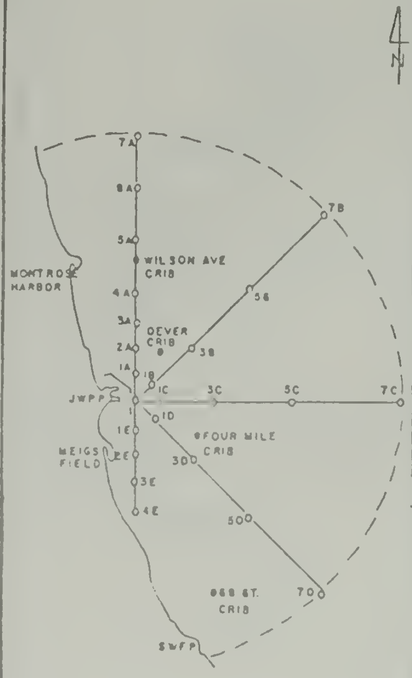
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

J.W.P.P. RADIAL LAKE SURVEY

DATE Sept. 18, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																						
		1A	2A	3A	4A	5A	6A	7A	1B	3B	5B	7B	1C	3C	5C	7C	1D	3D	5D	7D	1E	2E	3E	4E
		CHW052	CHW047	CHW042	CHW037	CHW033	CHW029	CHW025	CHW053	CHW043	CHW034	CHW026	CHW054	CWH044	CHW035	CHW027	CHW055	CHW045	CHW036	CHW028	CHW058	CHW051	CHW048	CHW041
TIME		0819	0823	0828	0832	0841	0850	0859	1015	1006	0952	0934	1027	1036	1050	1108	1224	1215	1201	1143	1238	1242	1247	1251
TEMPERATURE °C	00010	18	18	18	18	18	18	18	18	18	18	18	18	18	18	19	19	19	19	19	19	19	19	19
TURBIDITY F.T.U.	00076	1.8	1.5	1.3	1.3	1.3	0.85	1.0	0.95	0.65	0.40	0.35	1.3	0.75	0.50	0.35	0.95	0.80	0.55	0.45	1.6	1.4	1.2	1.0
ODOR, THRESHOLD	00086	IDM	IDM	IDf	IDM	IDM	IDf	IDM	IM	IM	IM	IDM	IM	IM	IDM	IM	IM	IM	IM	IM.	IDM	IM	IM	IM
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	21.0	21.0	22.5	23.0	22.8	22.0	23.0	24.0	22.5	23.0	23.0	23.5	22.7	24.0	24.5	24.8	24.0	23.5	24.5	25.0	22.0	23.0	23.0
CHLORIDE mg/l	00940	9.8	9.7	9.7	9.8	9.8	10.0	9.8	9.9	9.9	10.1	9.9	10.3	9.8	10.0	9.1	9.1	9.5	9.4	9.4	9.6	9.4	9.4	9.0
PHOSPHATE: TOTAL mg/l	00650	0.08	0.03	<0.01	0.04	0.02	0.05	0.07	0.16	0.03	*0.18	0.09	0.03	0.04	*0.34	0.07	0.02	0.09	0.03	0.02	0.02	<0.01	0.01	0.02
PHOSPHATE, DISSOLVED mg/l	00653	0.04	<0.01	<0.01	<0.01	<0.01	0.01	0.03	0.09	0.01	0.13	0.04	<0.01	0.02	0.24	0.01	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
CONDUCTIVITY µ mhos	00095	280	280	280	290	290	290	290	290	290	290	285	290	290	290	290	290	290	290	285	300*	290	295	290
RESIDUE, NONFILTRABLE mg/l	00530	4	7	7	8	4	5	3	6	7	9	4	8	1	3	5	2	2	1	7	1	4	1	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	11.4	11.4	9.5	9.5	6.7	9.5	6.7	9.5	6.7	9.5	7.6	9.5	10.4	9.5	7.6	10.4	9.5	8.6	9.5	8.6	9.5	7.6	9.5
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.19	0.17	0.19	0.18	0.19	0.19	0.18	0.16	0.16	0.15	0.16	0.18	0.17	0.14	0.13	0.18	0.19	0.18	0.17	0.21	0.21	0.19	0.20
NITROGEN ORGANIC mg/l	00605	0.20	0.20	0.20	0.20	0.20	0.20	0.16	0.20	0.20	0.20	0.20	0.20	0.16	0.16	0.12	0.16	0.12	0.12	0.20	0.20	0.20	0.16	0.20
IRON, TOTAL µg/l	01045	36	12	<10	10	11	42	<10	14	<10	<10	<10	<10	<10	<10	<10	<10	12	<10	<10	13	<10	<10	<10
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr, 35°C PER ml		64	28	26	30	18	19	9	9	17	8	7	9	14	7	4	5	4	1	9	8	7	10	6
MF-TC PER 100 ml	31503	4	2	0	6	6	6	16	2	4	0	0	4	0	4	0	0	0	0	2	0	0	0	0
MF-FC PER 100 ml.	31616	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MF-FS PER 100 ml	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PLANKTON PER ml.	60050	300	-	180	-	860	-	560	280	380	340	280	200	140	120	100	400	40	160	80	460	-	400	-
ACTINOS 14 DAY, 28°C PER ml	80148	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FUNGI PER ml.	31856	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	W	W	-	W	W			W
VELOCITY	00035	8	10	-	9	8			

SURVEY BY. J. Esposito / J. Vencill

REMARKS: * Rechecked

TABLE 24

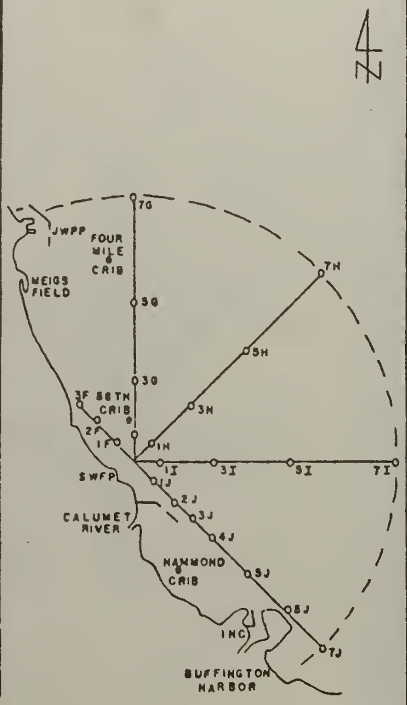
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE April 17, 19 79



PARAMETER	STORET NUMBER	1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW070	CHW073	CHW084	CHW074	CHW065	CHW057	CHW085	CHW075	CHW066	CHW058	CHW086	CHW076	CHW067	CHW059	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1128	1133	1137	0924	0915	0901	0843	1148	1157	1211	1229	0931	0940	0954	1012	1119	1114	1110	1105	1056	1047	1038
TEMPERATURE °C	00010	7	7	7	6	6	5	4	7	5	4	4	6	6	5	4	7	7	6	6	7	5	5
TURBIDITY F.T.U.	00076	2.7	2.7	3.2	2.7	2.5	2.1	1.4	3.1	1.3	0.75	0.55	2.3	1.7	1.2	0.50	3.3	2.7	2.3	2.1	2.2	1.3	0.85
ODOR, THRESHOLD	00086	10f	1M	1M	1M	1M	1M	1Df	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	2M	1M	1M
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	25.0	25.4	26.0	27.0	29.0	26.4	25.5	27.4	27.5	25.7	25.8	28.5	28.3	26.5	26.0	28.8	28.5	28.5	28.0	31.5	28.0	28.5
CHLORIDE mg/l	00940	11.2	11.4	11.6	12.5	13.0	11.8	11.0	12.5	11.4	10.0	10.4	12.0	11.2	10.2	9.6	10.8	10.4	10.2	10.0	11.6	9.4	9.4
PHOSPHATE, TOTAL mg/l	00650	0.07	0.08	0.09	0.16	0.08	0.18	0.07	0.09	0.06	0.03	0.03	0.08	0.09	0.07	0.03	0.07	0.09	0.06	0.07	0.07	0.07	0.03
PHOSPHATE, DISSOLVED mg/l	00653	<0.01	<0.01	<0.01	0.01	0.03	0.12	0.03	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.01	<0.01
CONDUCTIVITY µ mhos	00095	320	315	315	320	320	310	290	320	330	300	300	310	300	295	295	310	300	300	305	325	295	290
RESIDUE, NONFILTRABLE mg/l	00530	3	6	2	7	2	3	1	1	9	2	8	6	4	1	3	5	8	5	6	5	2	5
OXYGEN DEMAND, CHEMICAL mg/l	00335	7.5	8.5	8.5	9.4	8.5	9.4	8.5	11.3	9.4	11.3	2.0	0.9	5.7	5.7	6.6	6.6	10.3	7.5	5,7	8.5	4.7	6.6
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.94	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.38	0.40	0.40	0.44	0.47	0.38	0.34	0.45	0.35	0.26	0.25	0.42	0.34	0.27	0.25	0.31	0.30	0.27	0.26	0.31	0.24	0.21
NITROGEN, ORGANIC mg/l	00605	0.20	0.16	0.16	0.16	0.16	0.20	0.12	0.12	0.20	0.16	0.12	0.12	0.20	0.16	0.12	0.12	0.20	0.16	0.12	0.12	0.20	0.16
IRON, TOTAL µg/l	01045	65	110	62	180	38	46	330	42	30	48	10	52	63	36	10	58	32	46	20	23	12	320
PHENOL-LIKE SUBSTANCES µg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr., 35°C PER ml.		11	15	11	33	20	16	100	13	8	4	2	17	9	7	2	6	11	7	13	14m	8	2
MF-TC PER 100 ml.	31503	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	4	0	6000	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	28	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	360	-	680	1180	1380	540	280	1000	1600	320	800	1440	2360	3540	900	1580	-	3480	-	2620	-	1320
ACTINOS 14 DAY, 28°C PER ml.	80148	0	11	0	1	0	0	0	0	0	0	0	0	0	1	0	4	4	0	1	8	0	0
FUNGI PER ml.	31856	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA									PREVAILING WINDS
TIME		0800	0900	1000	1100	1200			00036
DIRECTION	00036	NW	NW	NW	N	NE			NW
VELOCITY	00035	3	3	2	2	2			

SURVEY BY: J. Esposito & J. Snadle

REMARKS:

TABLE 25 ·

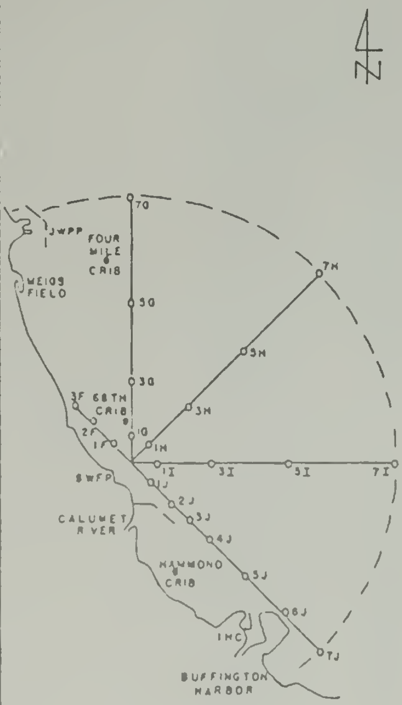
CITY OF CHICAGO
WATER PURIFICATION DIVISION

DEPARTMENT OF WATER AND SEWERS
WATER QUALITY SURVEILLANCE SECTION

BUREAU OF WATER OPERATIONS
WATER PURIFICATION LABORATORY

S.W.F.P. RADIAL LAKE SURVEY

DATE June 26, 19 79



PARAMETER	STORET NUMBER	SAMPLING POINT AND STATION NUMBER																					
		1F	2F	3F	1G	3G	5G	7G	1H	3H	5H	7H	1I	3I	5I	7I	1J	2J	3J	4J	5J	6J	7J
		CHW083	CHW078	CHW073	CHW084	CHW074	CHW085	CHW057	CHW065	CHW075	CHW088	CHW058	CHW086	CHW076	CHW087	CHW059	CHW087	CHW082	CHW077	CHW072	CHW068	CHW064	CHW060
TIME		1132	1137	1141	0929	0920	0906	0848	1155	1204	1218	1236	0934	0943	0957	1015	1123	1118	1113	1109	1100	1051	1042
TEMPERATURE °C	00010	16	16	16	16	15	15	15	16	16	15	15	15	16	15	15	16	16	17	16	16	16	16
TURBIDITY F.T.U.	00076	1.4	1.4	1.6	1.5	1.3	1.2	0.45	0.90	0.90	0.45	0.60	0.90	1.2	0.50	0.70	0.80	0.75	1.3	1.3	1.3	0.95	0.75
ODOR THRESHOLD	00086	1Df	1Df	1Df	2G	1G	1Df	1Df	2M	2M	1M	1M	1G	2G	1Df	1Df	1G	1G	2G	1G	1G	1G	2G
pH	00400	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3
SULFATE mg/l	00945	23.0	23.0	22.3	23.5	23.3	23.0	23.0	23.3	23.5	23.2	22.5	23.5	23.7	23.5	24.3	23.8	24.5	26.5	25.5	25.5	24.0	24.5
CHLORIDE mg/l	00940	10.8	11.0	10.8	10.8	10.2	10.8	11.2	11.2	11.2	10.2	10.6	11.2	10.8	10.0	10.0	10.2	10.8	11.2	10.8	10.6	11.2	11.6
PHOSPHATE, TOTAL mg/l	00650	0.04	0.02	0.03	0.02	0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	0.02	0.01
PHOSPHATE, DISSOLVED mg/l	00653	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CONDUCTIVITY μ mhos	00095	285	295	285	295	295	290	290	290	290	290	290	295	295	295	290	295	300	305	300	300	235	295
RESIDUE, NONFILTRABLE mg/l	00530	1	4	4	3	3	3	4	4	2	3	1	1	4	4	2	6	2	2	5	1	3	2
OXYGEN DEMAND, CHEMICAL mg/l	00335	8.7	10.6	9.6	11.5	9.6	8.7	8.7	6.7	8.7	6.7	6.7	9.6	8.7	6.7	6.7	9.6	4.8	9.6	10.6	12.5	10.6	10.6
NITROGEN, AMMONIA mg/l	00610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.10	0.08	0.02	<0.01	<0.01
NITROGEN, NITRITE-NITRATE mg/l	00630	0.19	0.19	0.18	0.19	0.18	0.19	0.21	0.19	0.19	0.21	0.20	0.19	0.19	0.20	0.22	0.19	0.20	0.23	0.23	0.22	0.22	0.20
NITROGEN, ORGANIC mg/l	00605	0.16	0.18	0.18	0.20	0.18	0.14	0.15	0.15	0.18	0.18	0.14	0.22	0.15	0.15	0.18	0.22	0.22	0.21	0.21	0.18	0.12	0.18
IRON, TOTAL μg/l	01045	12	10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	12
PHENOL-LIKE SUBSTANCES μg/l	32730	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PLATE COUNT 48hr, 35°C PER ml.	31753	41	18	17	16	10	21	18	21	12	6	2	30	1200	8	8	84	750	4800	2400	750	1200	400
MF-TC PER 100 ml.	31503	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	8	8	2	0	0
MF-FC PER 100 ml.	31616	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
MF-FS PER 100 ml.	31679	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0
PLANKTON PER ml.	60050	460	-	760	720	-	440	360	240	700	340	0	360	340	280	220	460	-	360	-	240	-	340
ACTINOS 14 DAY, 28°C PER ml	80148	0	1	2	1	1	0	0	1	0	0	0	1	2	0	0	1	3	0	2	0	0	0
FUNGI PER ml	31856	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

METEOROLOGICAL DATA

TIME		0800	0900	1000	1100	1200	1300	
DIRECTION	00036	S	SW	SW	SW	S	S	
VELOCITY	00035	6	7	7	9	8	7	

PREVAILING WINDS
00036
S

SURVEY BY M. Knianynycky & J. Shadle

REMARKS.

Appendix B

GLOSSARY OF TERMS

Appendix B

GLOSSARY OF TERMS

Actinomycetes. A group of organisms related to both fungi and bacteria with the capacity to produce quantities of odoriferous substances. Identification of their relative abundance in a drinking water source provides a parameter in the assessment of water quality. Organic substances such as phenol, cellulose and dead plant cells will provide sufficient carbon and nitrogen to stimulate actinomycetes population growth.

Chloride. Chlorides are one of the most common naturally occurring chemical constituents of surface waters. Sanitary wastes and certain industrial discharges may contribute significant amounts of chloride to receiving waters. At increasing concentrations chloride will cause a slight decrease in the solubility of oxygen in water and can harm metallic equipment along with agricultural plants.

Coliform, Total. Bacteria characterized by gram-negative asprogenous rods. Total coliform bacteria are associated with feces of warmblooded animals as well as in soils and on plants.

Coliform, Fecal. Bacteria that comprise a portion of the total coliform group. Fecal coliform are of more sanitary significance than total coliform because they are restricted to the intestinal tract of warmblooded animals. Consequently, this group serves as a reliable indicator of recent sewage contamination.

Conductivity. The measure of the ability of a substance to conduct an electric current. The measurement provides an indication of ion concentration or dissolved solids.

Fungi. Achlorophyllous organisms that are able to grow in the absence of light. Favorable growth followed by a large number die-off results in disagreeable tastes and odors.

Iron. Iron is an abundant element common in many rocks and soils and may be present in water in varying quantities, dependent upon the geology of the area and other chemical components of the waterway. Iron pollution sources include industrial wastes, mine drainage waters, and iron-bearing groundwaters.

Nitrogen, Ammonia. Ammonia nitrogen is one of the compounds resulting from the metabolic activity of living organisms. It may be present in surface waters as a result of agricultural runoff, certain industrial wastes, and runoff from pastures or feedlots. It is a component of sewage and relatively high concentrations may be found in the effluents of sewage treatment facilities. Ammonia is toxic to fishes and toxicity varies with water temperature and pH.

Nitrogen, Nitrite - Nitrate. Nitrates are the metabolic end products of organic nitrogen decomposition. They are commonly found in surface waters as a result of the decomposition of organic nitrogen in polluted streams and from sewage effluents, agricultural runoff, cesspool leaching, and industrial discharges. Nitrites in natural waters result from bacterial action upon ammonia and organic nitrogen. Because they are readily oxidized to nitrates, nitrites are not normally found in significant concentrations in surface waters. If present in sufficient concentrations in public water supplies, nitrate-nitrite may cause infant methemoglobinemia, a disease causing blood changes and cyanosis.

Nitrogen, Organic. Organic nitrogen is defined functionally as organically bound nitrogen. Organic nitrogen includes such natural materials as proteins and peptides, nucleic acids and urea, and numerous synthetic organic materials.

Odor, Threshold. Odor is recognized as a quality factor affecting water in several ways: Acceptability of drinking water, tainting of fish and other aquatic organisms, and aesthetics of recreational waters. Odor tests are performed to arrive at qualitative descriptions and approximate quantitative measurements of odor intensity. The method for intensity measurement is the threshold odor test.

Oxygen Demand, Chemical. A measure of the oxygen-consuming capacity of inorganic and organic matter present in water or wastewater.

pH. pH is the logarithm of the reciprocal of the hydrogen ion concentration. pH indicates the balance between the acids and bases in water and is the measurement of the concentration of hydrogen ions. By definition, the pH range is from 0 (most acidic) to 14 (most alkaline). Since the concentration of hydrogen ions regulates the degree of dissociation of many substances, pH may be a significant factor in determining limiting threshold concentrations in natural waters.

Phenols. Phenols are associated with industrial wastes from coal distillation processes and the manufacture of plastics, dyes, and disinfectants. Relatively small concentrations can cause taste and odor problems in public water supplies.

Phosphate, Total. Phosphate phosphorus is found in domestic sewage, some industrial wastes, and in drainage from agricultural areas. It is one of the nutrients responsible for excessive algae growth.

Phosphate, Dissolved (total filterable). The phosphate forms that pass through a 0.45 um membrane.

Plankton. Organisms (small animals-zooplankton and plants-phytoplankton) suspended in a body of water and because of their physical character or size are incapable of sustained mobility in directions counter to water currents.

Plate count. Number of colonies of bacteria grown on selected solid media at a given temperature and incubation period. The procedure provides a standardized means of determining the density of bacteria in water.

Potassium. Naturally occurring element that is an essential plant nutrient. High concentrations in water may be as a result of a discharge, ground water or sedimentary runoff.

Residue, Filterable. The dissolved mineral constituents of water that will pass through a 0.45 um filter and remain after evaporation. Also called total dissolved solids.

Residue, Nonfilterable. The portion of the total residue retained by a 0.45 um filter.

Silica, SiO_2. Silica is essential to diatoms which incorporate it into their exoskeleton. If other nutrients and light are available, diatom populations will increase causing a reduction in silica concentrations.

Sodium. Naturally occurring element in surface waters. Relatively high concentrations may be found in brines and hard waters.

Streptococcal, Fecal. The fecal streptococcal group of bacteria is closely associated with fecal and sewage discharges. This group serves as a supplementary indicator of recent sewage contamination.

Sulfate. Sulfate is a component of natural bodies of water. Abnormal fluctuations in background levels may be the result of industrial waste discharges as well as atmospheric precipitation resulting from the burning of fossil fuels. In drinking water supplies, high sulfate concentrations may have a cathartic effect.

Turbidity. Turbidity is a measure of the suspended particles such as silt, clay, organic matter, plankton, and microscopic organisms in water which are usually held in suspension by turbulent flow and Brownian movement. Turbidity is measured by comparing the optical interferences of suspended particles to the transmission of light in water in an instrument previously standardized with samples of standard turbidity units.

The definitions in this appendix were derived in part from the references listed below:

1. Illinois Pollution Control Board. 1977. Rules and Regulations, Chapter 3, Water Pollution, 54 pp.

2. McKee, Jack Edward and Harold W. Wolf, eds. 1971. Water Quality Criteria, California State Water Resources Control Board, Publication 3-A, 548 pp.

3. McNeely, R.N., V.P. Neimanis and L. Dwyer. 1979. Water Quality Sourcebook, A Guide to Water Quality Parameters. Inland Waters Directorate, Water Quality Branch, Ottawa, Canada. 89 pp.

4. Rand, M.C. 1975. Standard Methods for the Examination of Water and Wastewater, Fourteenth Edition, American Public Health Association, 1193 pp.

5. U.S. Department of the Interior. 1966. Sanitary Significance of Fecal Coliforms in the Environment, Federal Water Pollution Control Administration, WP-20-3, 122 pp.

6. U.S. Department of Transportation 1976. Water Quality Manual, Vol. 4 of Implementation Package 77-1.

7. U.S. Environmental Protection Agency. 1976. Quality Criteria for Water, 256 pp.

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